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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

VOL. CLIV. No. 3021.] LONDON, APRIL 6, 1921. [73RD YEAR. PRICE 1s.

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EDITORIAL NOTES.

The Strike against the Restoration of Economic Conditions.

In less than six months the coal mines of the country have been for the second time abandoned by the workers. On this occasion there has been no ballot of the men; and so the sole responsibility rests with the fanatics who possess the major power in the Miners' Federation. This time the consequences will in all probability be disastrous for some time ahead both for the coal industry and the country. But temporary evil has to be encountered in order to secure (it is hoped) lasting good. It is well to get the position into positive focus. This is not a fight between the coal owners and the miners so much as between the Miners' Federation and the Government and, as a matter of fact, the whole country. It is true that the owners and the Miners' Federation could not agree on the point as to whether the settlement of wages should be on a national or on a district basis; but the matter that determined the Federation to bring about this catastrophe was the refusal of the Government to continue to subsidize the industry, in order that the miners might still enjoy wage conditions which the economic state of the industry will not justify, and indeed definitely prohibits. The Secretary of the Federation himself admits that the industry is not in a position to pay present wages unaided by some external source of revenue. Folly and madness are at the helm of the Miners' Federation at the moment; the blind hope is being indulged that a wrecking policy will ensure compliance with unreasonable and preferential demands—demands upon the taxpayer which the workers (who are directly or indirectly themselves taxpayers) in other industries cannot enforce for themselves. We hope that the other trade unions of the country will give serious consideration and due weight to the matters that are at the bottom of what has happened and is happening. The railway and transport workers (the other two members of the Triple Alliance) have been invited to support the miners, and on the subtle ground that the miners are making a stand against what is the beginning of an attempt to effect a general cut in wages—wages inflated through war and subsequent conditions, and increases obtained by the holding of the strike pistol at the head of the Government or employers whenever on any pretext additional payment was sought. It is really nothing of the kind; and the leaders of other trade unions know full well that the action of the Miners' Federation is simply rebellion against, and resistance to, something that is obviously economically essential. They refuse to allow economic necessity to have any place in the decision as to what the pay of the miners shall be. If this were the policy generally adopted in industry, it would simply mean a complete industrial and national collapse. That way we cannot possibly live. There is trade depression and unemployment all around; and the senseless, illogical policy that has brought about this strike will quickly cause—it has already made a good start—the closing of many works in other industries, and the expansion of unemployment. Without this coal strike, restoration of the country already required a new industrial basis; the coal strike is bringing about conditions which will necessitate still more drastic reform. Do the miners and the other trade unions appreciate this?

The stoppage of the coal mines took place on April 1. Their abandonment by the coal getters was complete, though enthusiasm among the men was not such as the Federation would have chosen to witness. They are simply the automata—the slaves—of a dictation the reasons for which the greater number of them do not understand. But what they do understand is that, when pits are flooded and mechanical ventilation is stopped, their means of livelihood on the collapse of the strike will take considerable time to mend, and in many cases the cost of the mending would not justify its execution, and so unemployment will exceed the duration of the actual strike, and thousands of the members of the Federation will have to seek employment elsewhere. The decree of the Federation was that all grades of employees were to cease work; and this included the engine and the pump men. This means wrecking many pits; and the lasting penalty of the insensate folly has already been paid in several cases. The owners have appealed for voluntary aid to keep the pumps and ventilating apparatus at work. In some cases the engine men, with the authority of their fellow workers behind them, declined for a time to quit their posts; and in other cases officials and clerical staffs are fighting hard to keep the mines free from water and gases. If there is one thing more than another that will make the miners rebel against the mad policy of their leaders, it is this one feature that threatens to destroy, or prolong beyond the termination of the strike the discontinuance of, their earning power. The miners already see danger. They know that the liquid reserves of the unions will not last long. Many of them have been enrolling themselves as unemployed to get unemployment pay; but the Ministry of Labour have decided, and that wisely, that the stoppage is due to a trade dispute, and so, under the provisions of the Act, this disqualifies the miners from benefit. The Federation, on the other hand, contend that it is a lock-out. By what stretch of imagination they do this, we cannot tell. It was the order of the Federation that the men are out on strike; and the mines are open to the men to return to work as soon as they like, at a rate of wages that the mines can afford to pay. The matter of unemployment pay is to be put to the test. If, however, we gauge the position correctly, the miners themselves will find occasion to bring the strike to an end as soon as they realize the false position into which they have been precipitately run by their so-called leaders.

This, of course, is only a surmise. In such a condition of things, caution is at present very necessary. Effective may be, so far as we know, the sedulous dissemination of the view that this is the opening struggle against cutting-down wages, without reference to the blacker outlook for the country if they are not brought into reasonable relation with work done. The King has issued a proclamation under the Emergency Powers Act of last year; and steps are being taken to protect the country in respect of food, light, heat, and transport, and to make the fuel resources spin-out to meet whatever may be the duration of the contest. The Board of Trade at the week-end issued directions for conserving the available supplies of coal and other fuel. The directions are noticed on a later page of this issue; and the parts referring, with certain modifications, to gas are reprinted *in extenso*. The lines of the instructions as to gas are the same as those promulgated last autumn at the time of the then coal strike. In the production of gas, coal is to be used in such manner as to effect the greatest possible saving. We all know what that means. Adequate pressure is to be maintained during the periods of effective use of the gas; but at other periods the pressure may be lower than that prescribed in any Act or Order as may be best calculated to secure a supply of gas at adequate pressure during the periods of effective use. Notification of the times of reduced

pressure must be published as directed. Relief is given from all obligations in regard to quality, &c. In the case of both gas and electricity, all display lighting is to be discontinued; and only necessary lights in shops will be allowed. Public lighting is to be reduced to the minimum, subject to the decisions of the police in respect of public safety. In the case of power, there is to be a reduction to 50 p.ct. of the weekly average quantity supplied or used in the period covered by the last reading of the meters. The difficulties of this were brought to the notice of the authorities on the occasion of the strike last autumn. But on satisfactory proof being given to the local authority that it will be in the public interest, there may be relaxation of this particular limitation. Responsible officials should pay especial attention to the details of these matters as set forth in the directions—not overlooking the fact that it will be just as well, apart from patriotic and moral obligations, not to offend against the directions by non-compliance.

Fortunately, generally speaking, the available stocks of coal at gas-works are good—in quantity if not in quality. There has been much gas coal buying in the open market lately. The big concerns anyway have sufficient coal to last as long as it is likely the strike will continue. And, so far as gas supply is concerned, a more convenient season there could not be for a coal strike, with "summer time" now here, lighting reduced, and domestic heating approaching its minimum. But regard has to be paid to two possibilities. The one is that the railway men may refuse to carry coal that is available; and the other is that, through the withdrawal from the mines of the engine men, and the consequent destruction there will be, with the delay in getting mines into working order again, the end of the strike may see laggard supplies and deliveries for some time beyond. But *per contra*, though a somewhat small consolation, we ought soon to see moving off into use those large accumulations of coke which have been causing so much discomfort to gas managers.

However, whatever happens, in any way, let it be borne in mind that this is a struggle on the part of the Miners' Federation against the restoration of an economic basis for the coal industry. We all know what their success would mean for the country; and therefore all inconvenience must be shouldered with fortitude and confidence in the issue. But the position is one of great gravity; and as this issue of the "Journal" is going to press and is being circulated, decisions are being taken by the railwaymen and the transport workers which, if in support of the miners, may mean more reckless measures to create unprecedented chaos in the country for the express purpose of compelling compliance with the demands of the Miners' Federation. In our opinion, the Government will have a stiff-backed public supporting them.

Oxygen in the Production of Cheap Heat Units.

The paper on the use of oxygen in gas production that Prof. Cobb and Mr. H. J. Hodsman read at the last meeting of the Institution of Gas Engineers bids fair to become a classic in gas-manufacturing literature. Anyway, it has attracted attention throughout the gas industry of the world; and we know that the further special contribution to our columns by Mr. Hodsman on Jan. 12 has done the same. It has since been seen that technical gas men in Switzerland are investigating the subject; and our American friends are active in the same direction. We welcome all this; but we hope the British gas industry will, in this matter, give Prof. Cobb and his colleague all the head they require, so that this country may not be left behind in the investigation and development of this promising system. The paper we reprinted last week by Mr. E. A. W. Jefferies, of Worcester, Mass., is another contribution of the first order to the subject; and it augments interest because it opens it up from another aspect. While Prof. Cobb and Mr. Hodsman developed their case with gas-retort practice as the basis, Mr. Jefferies' study is founded upon gas-producer practice, with which he is more at home. On this side, we are gratified with the author's well-justified recognition of the splendid work of Prof. Cobb and Mr. Hodsman; and in terms of equal sincerity we can reciprocate the compliment in respect of the work of Mr. Jefferies.

Taking gas-producer practice, the author, it will be seen, treats of the matter from two points of view—the amount of the oxygen required in the steam-oxygen process of gasifying coal, and the value of the gas produced. Throughout the discussion of this subject, the success of the process, it has so far been emphasized, is largely dependent on the price at which oxygen can be placed at disposal; but the prospects look so good through the work of Jefferies-Norton in the separation of the gases of the atmosphere, that the Institution paper opened to view the likelihood of oxygen being produced, according to the scale of working, at from 6 c. to 30 c. per 1000 c.ft. Mr. Jefferies confirms hope in this respect, because, even at present capital and labour costs in America, he calculates that it would be possible to produce, with a plant operating at full capacity and yielding 3 million cubic feet of oxygen per day, at a cost of 10·10 c. per 1000 c.ft., while with a plant producing 2 million cubic feet of oxygen per day, the cost would work out to 15·10 c. per 1000 c.ft. These are favourable figures, because assuming 15 c. per 1000 c.ft. for the oxygen, and that 200 c.ft. must be consumed per 1000 c.ft. of gas made, the oxygen would cost only 3 c. per 1000 c.ft. of gas delivered to the distributing mains. But as the scale of operations descend, the cost of the oxygen ascends. And the gas-works are few in number that have a minimum daily demand upon them for 10 or 15 million cubic feet of gas. Therefore the process, anyway at the outset, could only be applied, except at higher costs for oxygen, in gas-works that could utilize it on a large scale; and for the technical men in smaller works, we fear, it could only be regarded for some time to come as a matter for remote interest. Of course, where there were conveniently situated groups of works, there might be a central oxygen producing station; and even with distribution expenses this might pay. In saying this we are getting far beyond the initial stages of the matter; and when once it is proved that gas can be made cheaper by the oxygen-steam method of gasification, developments in practical application are bound to follow rapidly. But that time is not immediately at hand; and in the beginning the utilization of the process will be limited to works of large resource, where the oxygen plant will be an integral part of the gas-manufacturing process.

In any comparisons that are made between the results set out in Mr. Jefferies' paper and that of Prof. Cobb and Mr. Hodsman, the fundamental differences must be borne in mind—such as the method of treating the coal, and the fact that the coal used in the American case is a high-class one, having a heat value of 14,240 B.Th.U. per pound. Excluding the condensable tar, the heat value of the coal is 13,240 B.Th.U. Using 30 lbs. of dry steam and 640 c.ft. of oxygen per 100 lbs. of coal treated, rather more than 69,000 c.ft. of 400 B.Th.U. gas are produced per ton, which means that no less than 93·8 p.ct. of the heat of the coal is put into the gas, or including the heat of the steam with that of the coal, the heat in the gas is equal to 91·7 p.ct. The 640 c.ft. of oxygen per 100 lbs. of coal works out to 206·5 c.ft. per 1000 c.ft. of 400 B.Th.U. gas. These figures picture a condition of things that looks like the acme of efficiency in gas production. Moreover, in these times to consider the total cost of raw gas at 11·6 c., and coal at $4·50, only causes one to sigh for conditions that appear altogether beyond reach. But seeing that coal stands for 6·52 c. out of the 11·6 c. per 1000 c.ft. of raw gas, even at double the cost for coal, gas on this producing basis could be sold at a low price per therm—1000 c.ft. being equal to 4 therms.

The Lower Heat Loss of the Leaner Gases.

The paper by Mr. Jefferies is full of interest; but in the editorial columns we cannot follow it through point by point. There is, however, an addendum to the paper which is of particular interest, bearing as it does upon the gas polemics of the times. It deals with the relative efficiency of gases in high-temperature heating. It goes to show, among other things, that there is economy in the use of the leaner gases, compared with the higher calorific grade gases. The thesis is developed largely from the point of view of flame temperature, which in the case of water gas or steam-oxygen gas is some 13·5 p.ct. higher than that of natural gas. The lines of the argument will be of particular interest to those who want to maintain high calorific value per cubic foot, and not by any means less—in fact, considerably more—to those who desire to put into their mains more heat units per ton of coal treated. It has been seen that, with the oxygen-steam process as investigated by Mr. Jefferies, the gas will be of 400 B.Th.U.; and the object is to demonstrate that such gas can be used with a higher efficiency than a gas richer in hydrocarbons, and having a relatively high calorific

value per cubic foot. This has been shown previously; and various causes have been assigned for it. The difficulty of bringing about, under the conditions of use, an intimate admixture of the rich gas and the primary air is one; and the difficulty of regulating the primary air supply with the same ease with a rich gas as with a poor gas is another. A further reason is that, the richer gas requiring more volumes of air per cubic foot for its complete combustion, a greater quantity of heat is carried off with the products of combustion; and this affects flame temperature. Some observers say the difference in heat loss through this is inappreciable; others, that it is material. Mr. Jefferies is ranked with the latter. He asserts that the hydrocarbon gases waste three times as much heat to the atmosphere in the products of combustion as is wasted by either carbon monoxide or hydrogen from the same cause. The hydrocarbon gases require some four times as much air to burn them as carbon monoxide or hydrogen. This occasions a greater volume of products, and so heat losses, which in turn reduce flame temperature. This being so, it follows that the commercial gas which contains the highest proportion of carbon monoxide and hydrogen is the most efficient for practically all purposes. This is another point for the Carbon Monoxide Committee to make a note of.

The authors institute a comparison to illustrate what is meant by their declaration that with the leaner gas appreciably less B.Th.U. would have to be fed into a furnace than with the richer gas. Contrasting 400 B.Th.U. gas with natural gas, with the former 200 B.Th.U. would be left in the furnace, while with the latter gas only 400 B.Th.U. would do useful work, and 600 B.Th.U. would be lost. Thus out of 1000 B.Th.U. supplied by the 400 B.Th.U. gas, 500 would be usefully employed, and only 400 of the 1000 B.Th.U. of the natural gas. Moreover, with the leaner gas, the flame temperature being higher, the rate of heating would be approximately 25 p.ct. faster; so that 25 p.ct. less B.Th.U. would be required to obtain the desired result. These economies as expressed here may not appear, *prima facie*, to be substantial; but industrial uses are large uses, and therefore the aggregate saving would be considerable. These calculations (which are borne out by observation), Mr. Jefferies remarks, show the "folly" of buying gas on the B.Th.U. basis. This is a statement that would not apply if the richer gases per cubic foot are ruled-out; and, as a matter of fact, the author himself qualifies it in a footnote when he says that the remark applies more to natural gas than to any other. Thus his view on the point need not trouble us in this country, as we are not likely to supply natural gas here, and the bulk of the gas that is sold in this country will before long in all probability be ranging between 450 and 500 B.Th.U., with the volume sold outside these figures small in proportion. However, this is a small digression; and we may return to the question of losses with different calorific grades of gas. In a large percentage of operations where the loss to the chimney is in still greater proportion (that is, where high temperature is required), the relative heating value of the leaner gases has nearer equality with the richer gas, and may even in some cases surpass it foot for foot. This would not apply, for example, to steam-raising, in which there is nearer approach to equal efficiency between the leaner and the richer gases.

All these points are excellent in the advocacy of a lower calorific power gas. Before concluding, Mr. Jefferies inspires hope of the gas industry, through the oxygen-steam process, being placed in a still stronger position as the supplier of heat units. Not only does a gas such as is described by him—a gas of 400 B.Th.U. as made by the process—possess much greater effective heating value per B.Th.U. than natural gas or even any other gas now used commercially, but, in addition, it has the advantage of costing less than half as much to produce and deliver to the consumer as present-day gas. In this connection we have to remember that the author was speaking from an American platform and in relation to American conditions. Just one other point. Having regard to the importance of flame temperature, Mr. Jefferies suggests that it will be quite safe to introduce oxygen into the gasholder up to 5 or 6 p.ct. of the whole volume of gas. This would increase the rapidity of combustion and flame temperature; but care would have to be exercised that this was only done so far as is found practicable and profitable. We do not want an accretion of efficiency at the burner at heavy cost elsewhere.

Joint Effort to Produce Higher Economy and Efficiency.

In the current issue of the "Bulletin" of the Society of British Gas Industries, Sir Arthur Duckham (the President) addresses a message to the members in regard to the lines which he considers they should take up to help to improve the position of the gas industry at the present juncture. But the message covers topics which justify a reference to them here, so that what the author has to say regarding them may reach the eyes of a greater number of readers. To us, there appears to be a note of dissatisfaction running through the message. It is dissatisfaction with certain present conditions; but it is not the form of dissatisfaction that arises from the innate tendency of some persons to grumble. Sir Arthur is too optimistic, and has too lively a disposition for that sort of thing. It is the dissatisfaction of the active mind, the mind with ideals, the mind that believes always there is room for betterment when the opportunity presents itself, or when the essentials for making it have been found. In the first place, gas consumption is the basis of all the business of the members of the Society. The truth may not have been grasped in every quarter. Nevertheless it is a truth; and we do not believe that any members of the Society would boldly attempt to controvert it. It is too plain for that. Therefore it is to the interest of the members to do all they possibly can to support any and every co-operative endeavour to enlarge the consumption of gas, which means, in one direction, the support of the British Commercial Gas Association.

Bearing upon this matter is the new legislation; and Sir Arthur feels this has done a good part in shaking-off the chains that have bound the manufacturers to types of plant and apparatus which were not the most efficient, and which therefore impeded the development of that basic necessity to their business—gas consumption. Furthermore times are bad in respect of capital; and gas undertakings have to be as frugal as gas demand and plant conditions will allow them to be in the expenditure of money. The new legislation has provided greater scope in designing plant of a more efficient character. In view of this extension of liberty and the dearness of money, it is the business of the manufacturers to submit to the gas industry schemes and methods for improving its present operations, whether in manufacture, treatment, or supply, which will enable economies to be effected with a resultant reduction in the price of gas. "Economy and efficiency are the two factors "that can put the present situation straight, and achieve our "natural desire that the gas industry should recover from "the present slump more quickly than any other industry "in the country." We like the tone of this. It shows there is resident in the mind of the President a strong belief that more can be done to convert the heat units of coal with greater economy into heat units of gas, and to bring about greater efficiency in their utilization.

The highest efficiency is not to be obtained only by the provision of plant that can be worked efficiently. It is not always so worked. Sometimes it is found that supervision of the right order is lacking; sometimes that the plant is not given the best operating conditions through the purchase of unsuitable coal. A strong point is made by Sir Arthur. He considers that the managers of gas undertakings would be well-advised to give the selection of coal far greater care than they have done in the past. In this connection, he remarks: "Undoubtedly the cause of much inefficiency has "been that coals have been bought in a haphazard manner "with only one factor considered—*i.e.*, price. With freights "up, labour up, and all prices ruling high, the position is "entirely changed from what it was before the war. My "personal opinion is that in many cases the whole financial "position of a gas undertaking can be changed by the "careful selection and estimation of the value of the "coals to be used." That is a robust statement which "the many cases" will have an opportunity to put to the test when the coal industry gets back into regular business habits. The managements of gas undertakings for close upon seven years now have not been allowed much opportunity of making a selection of their coals. They have been beggars for supplies, and have had largely to take, under the sway of those who respectively controlled output and distribution, just what coal was delivered. There has been no opportunity for selection; and naturally under such conditions the producing plant has not been able to work or to be worked at the highest efficiency. The results have

been far from pleasing to the owners of, and contractors for, the plant. These experiences may have deepened and hardened the opinion of the President of the Society that gas managers in "many cases" pay more heed to the prices than to the qualities that will contribute to high efficiencies, and which pay. But these matters are going to be dealt with in a more scientific fashion in the future; and if in "many cases" the whole financial position of a gas undertaking can be changed by the careful selection and estimation of the value of the coals to be used, we ought to see before many months are over the effects of the revival in respect of coal of the selective power that will be restored to gas managers. Then, again, it is clear Sir Arthur is not satisfied that the best is being done in regard to the quality of the refractory materials supplied. Anything that can be accomplished in increasing the life of retort-settings will be an immense advantage. "If we all took thought and considered our materials from the points of view first of suitable quality and then of profits, I am certain both sides of the industry would gain greatly."

Some pertinent remarks are made on the subject of coke quality. The responsible men of most gas undertakings have been bemoaning the slump in the chief secondary products, and have been watching the accumulations with feelings of anything but pleasure. Can coke be made more attractive to those requiring solid fuel? There is optimism and confidence in the reply of Sir Arthur. Much can be done to "improve present methods of dealing with coke. "Revenue from coke can and should be greatly increased." That is easier said than done. To bad quenching he attributes the frequent spoiling of sales. Coke is sold containing 10 to 15 p.ct. of moisture, which greatly hampers its use for domestic purposes. Much might be done too to improve the design of coke-screening plants, which are described as being in most cases inadequate and inefficient. Anyway steps should be taken to remove from coke the rubbish which is to-day often delivered to the works with coal.

The message is an opportune one. It indicates certain lines along which work should be pressed with the view of producing greater economy and efficiency. It is work in which the manufacturers of gas plant and appliances and the makers of gas can all take part; for all are concerned in the attaining of any and every means by which gas can be made more economically and sold more cheaply. Every process and every product should within the compass of opportunity be made to contribute to this end. The message would form an excellent supplement to the Presidential Address recently delivered by Mr. James Paterson to the Midland Association of Gas Engineers and Managers.

The Completed Returns.

The returns relating to the gas undertakings of local authorities for the year 1919-20 have now been issued by the Board of Trade. The returns giving the statistics for the statutory companies were published towards the end of last November, and were noticed in the "Journal" for Dec. 1. The authorities' returns tell the same tale as those of the companies as to the heavy cost of doing business, as to the consumers being supplied at prices which did not increase the balance of gross revenue; and yet, in spite of high prices, the gas business of the 311 local authorities concerned shows an increase, contrasted with the pre-war year, of upwards of 8 p.ct., which percentage represents the large volume of 6,245,414,000 c.ft.—the consumption for the year having been 82,544,688,000 c.ft., compared with 76,299,274,000 c.ft. in 1913-14. Despite all restrictions, and a disinclination to press for business under existing cost conditions, the number of consumers of the local authority concerns has gone up by 141,290, to 3,029,538. It is interesting, in view of the millions dealt with, to see how the increase of receipts (due to higher prices and increased business) has kept in proximity to the increase of expenditure. The total receipts in 1919-20 were £22,776,613, as compared with £12,206,595 in 1913-14—an increase of £10,570,018. The expenditure amounted to £20,230,061, compared with £9,661,310 in 1913-14—an increase of £10,568,751. So that the additional receipts of all the local authority undertakings only exceed the additional expenditure by £1267. This last-named sum is therefore the small difference that existed on the revenue balance between the two years. In the year 1919-20 it was £2,546,552; while in 1913-14 it was £2,545,285. The coal carbonized by the 311 concerns showed a reduction of 416,310 tons—the figures being for 1919-20 6,437,015 tons, and for 1913-14 6,853,325 tons. As the consumption of gas shows the considerable increase already mentioned, it is obvious that the extra gas has been largely derived from the water-gas plants. The volume of coal gas made from the lower quantity of coal also increased. It was 78,735,879,000 c.ft., or 1,861,130,000 c.ft. more than in 1913-14. The amount of water gas made in 1919-20 was 9,908,229,000 c.ft., or 4,521,741,000 c.ft. more than in 1913-14, or very nearly 84 p.ct. Other gas (mostly coke-oven gas) amounted to 95,522,000 c.ft., or an increase of 91,229,000 c.ft. on 1913-14. On the aggregate of the coal and "other" gas, the make of water gas in 1919-20 only represented about 12½ p.ct.; but this, of course, is no indication as to individual percentages.

Now that the local authority returns are available, comparisons can be made, for the whole of the statutory gas undertakings, with the year 1913 for the companies and with 1913-14 for the local authorities. For simplification we will speak of the years 1913-14 and 1919-20—the one the last complete year before the war, and the other the first one after the armistice; but be it remembered prior to restrictions on consumption being removed. The two classes of undertakings now embrace a total of 816 concerns, or 15 less than in 1913-14—due, we take it, to amalgamations. In 1919-20, the aggregate receipts were £65,814,097, as compared with £35,503,558 in 1913-14. The causes for this tremendous flight need not be referred to again. They are reflected in the expenditure, which in 1919-20 was £59,364,370, compared with £28,242,104 in 1913-14. These figures show that, whereas the receipts advanced by £30,310,539, the expenditure to carry on the service was higher than in 1913-14 by £31,122,266—a difference to the bad of £811,727. And this without taking into account interest and dividend charges. In 1913-14, the total undertakings showed a gross profit of £7,261,454; but in 1919-20, despite the fact that the receipts were almost doubled, the gross profit amounted to only £6,449,727. The coal carbonized in 1919-20 was 17,033,712 tons—an advance of 61,988 tons on 1913-14. The total quantity of gas made was 249,566,414,000 c.ft.—an increase on 1913-14 of 25,049,247,000 c.ft. Analyzing the total production, it is seen that 206,351,808,000 c.ft. of coal gas were made, or more by 10,525,239,000 c.ft. The quantity of water gas generated was 38,632,037,000 c.ft., or more by 14,853,428,000 c.ft. than in the year 1913-14. And the "other gas"—mostly coke-oven gas—amounted to 4,582,569,000 c.ft., or a decrease of 329,420,000 c.ft. Seeing that many undertakings have no water-gas plants, and that practices and demands vary as between different gas-works, there is not much value in stating the percentages of water gas to coal gas. However, for what they are worth, here they are. The total quantity of water gas made in 1919-20 represented a little over 18 p.ct. upon the combined figure for coal and "other" gas, while in 1913-14 it was nearly 12 p.ct. The increase in the water gas itself between the two periods was 62·4 p.ct. The total quantity of gas sold in 1919-20 was 228,537,998,000 c.ft., or more than in 1913-14 by 22,063,525,000 c.ft., or 10·68 p.ct.; and this notwithstanding fuel rationing.

The increase is an excellent one, in view of high prices for gas, and the little pressure that is being put into the obtaining of new business owing to high costs of material and labour and dear capital. The business, however, grows on its own merits, and consumers come in uninvited, and the demand for appliances knows no abatement. Between 1913-14 and 1919-20, the number of consumers grew to 7,540,133—a gain of 437,020, although many concerns discontinued hiring-out and other business promoting methods. Those of our competitors who institute percentage comparisons from their own records with the increases of the gas industry, will please make due allowance for the size of the gas figures for 1913-14.

"Summer Time."

Let us place on record for future reference that "summer time" started last Sunday morning. Timepieces were put forward an hour; and so an hour's less artificial lighting has to be furnished for six months. The official change back will be made in the early morning of Monday, Oct. 3.

Power to Control Gas-Works.

In connection with the present industrial crisis, drastic and far-reaching powers have been conferred on the authorities by

regulations made by Order in Council under the Emergency Powers Act. Among them, it will be seen by the notice elsewhere, is power to control gas, water, and electricity undertakings.

From the School of Experience.

A great deal has been heard of late regarding the education and training of a gas engineer. Never was a subject more appropriate than at the present time; and there are good signs that a larger view and action are being taken in this matter. The aspirants for high position in the gas industry will be stimulated by the knowledge that through higher training the competition for the best places will be keener in the future than in the past. But the man will not be fully competent for the best positions who only recognizes that qualification begins and ends with theoretical and practical training and knowledge. There is much beyond that; and it is because of this that many men highly trained technically are sometimes found to make extremely bad managers. Gas students who want to know what we mean by this can satisfy their curiosity by reading the address that Mr. John Fraser, of Dalmarnock, delivered to the Scottish Junior Gas Association [Western District] at their meeting last week. The address is a digest of the experience of a technical officer who has been an observer of what is necessary, from student days onwards, in forming character and conduct in one who aspires to the position of a chief official in a gas undertaking. We will not comment on the address. We agree with every word of it. "There is more than the ordinary training required before a student may hope to become a successful assistant, far less a full-fledged manager." And what that "more" is, Mr. Fraser tells in his address, which we hope every junior and student in the industry will read and profit by.

Pipes and Castings Prices.

One must not jump to hasty conclusions upon the report of the Sub-Committee appointed by the Standing Committee on Trusts, to inquire into the existence of a price-regulation combination in this country for pipes and castings. There is sufficient in the report to cause one to refrain from any pronounced judgment as to the actual effect of the existence of the Cast-Iron Pipe Association. We, of course, prefer open competition. In this case, however, it is seen that, though minimum prices are fixed, and manufacturers take turn (so the report says) in sending in a somewhat lower price than the minimum when tenders are invited, and though this cuts-out the element of competition among home makers, the Sub-Committee could not find that profits were unreasonable, unless, in the case of pipe makers who are producers of or traders in pig iron, actual profits are hidden away under that primary commodity. Besides, there is the keen competition of foreign makers, and of steel and concrete pipes. In this instance, it is from abroad that the severest price competition will come, and that now increasingly. This reduces the effect of any price-regulating scheme at home.

British Dye Development.

Those critics who speak disparagingly of what the British Dyestuffs Corporation are doing will find their answer in the address last Friday of Sir Henry Birchenough, Bart., K.C.M.G., to the stockholders. Sir Henry, as a member of the Board of the Imperial Continental Gas Association and of the Continental Union Gas Company, knows a great deal about the position of the gas industry in the production of the raw materials for dye purposes; and the importance of the gas industry and dye factories in combination when war disturbs the peace of the world. The Corporation are able to pay a dividend at the rate of 8 p.ct. per annum on the preferred ordinary capital, less income-tax. That is good. The output by the Corporation of finished dyestuffs during the year shows an increase of 54 p.ct., and the manufacturing capacity places the concern among the principal dye producers of the world. During the first two years' operations, the Corporation have spent on research £289,366, which includes the capital expenditure for the foundation of a permanent research organization. There is also a reserve fund of £100,000 for research. A scheme of internal reorganization of the personnel of the direction and staff has been proceeding, and is not yet quite completed. It will inure to still higher efficiency. The Chairman looks for good effects for British dye production from the Dyestuffs (Import Regulation) Act.

THE COAL STRIKE AND INDUSTRIAL CRISIS.

Power to Control Gas Undertakings.

The present industrial crisis has resulted in extensive precautionary powers being conferred on the authorities by an Order in Council under the Emergency Powers Act. Among the measures authorized to be adopted and enforced by the competent Government Departments are:

To take possession of lands, buildings, or works, including those of public utility undertakings.
To take possession of food, forage, material, and stores.
To regulate and control road transport, and to take possession of or hire compulsorily horses and vehicles.
To take over tramways and light railways in whole or in part.
To control traffic on highways.
To grant motor driving licenses.
To control canals and canal traffic.
To close ports or harbours.
To regulate and restrict traffic by sea.
To prohibit the export of any goods.
To take possession of coal mines, machinery, plant, wagons, and stocks of coal, and to regulate coal supplies and fix prices.
To control gas, water, and electricity undertakings.
To regulate or prohibit the sale, delivery, or use of motor spirit.
To restrict the use of the telegraphs.

Failure to comply with the regulations under these heads, or any attempt to interfere, or to induce others to interfere, with their due fulfilment or enforcement, will constitute an offence for which the maximum penalty will be three months' hard labour, and a fine of £100.

"Coal" Includes Products.

The section of the regulations referring to coal mines and the disposal of coal, distribution, and prices provides that, for the purposes of this regulation, the expression "coal" shall include the products of coal, and gas and electricity made from or by means of coal, whether for lighting, heating, or any other purpose.

Gas, Water, and Electricity.

The section applying to gas, water, and electricity undertakings is as follows:

It shall be lawful for the Board of Trade or for the Minister of Transport by Order to require the owners of any undertakings for the supply of gas, water, or electricity to comply with any directions given by the Board or Minister as to the supply thereof.

Where any such Order has been issued, or where in pursuance of the powers conferred by any of these regulations possession has been taken of any works for the supply of gas, water, or electricity, it shall be the duty of the owners of the undertaking and of every officer and servant of the owners, and where the owners are a company of every director of the company, to comply with any direction which may be given by the Board or Minister.

Motor Spirit.

Makers of benzole will be interested in the following:

The Board of Trade may by Order prohibit or regulate the sale, supply, delivery, or use of motor spirit, and require any persons owning or having the power to sell or dispose of motor spirit to place the same at the disposal of the Board or of any person authorized by them. In this regulation the expression "motor spirit" includes any inflammable liquid substance capable of being used for the purpose of driving motor vehicles.

Regulations for Gas Supply during the Strike.

The Board of Trade, under the Emergency Regulations, 1921, have issued a series of 36 directions regarding the supply of coal, gas, and electricity. These regulations came into force on the 2nd inst., and so must be complied with immediately.

The first part of the regulations refers to the duties of local authorities in connection with carrying-out the directions.

The second part deals with household or domestic coal. This group of directions makes it unlawful for anyone to purchase, obtain, take delivery of, or in any way acquire for consumption, more than 1 cwt. of coal in any week, or to purchase any coal for consumption where the quantity already available on the premises exceeds 5 cwt. The same instructions necessarily apply to the sale of coal.

The third part of the directions applies to industries and businesses; and in this case the consumption is to be restricted so that not more than 50 p.ct. of the weekly average quantity of coal consumed in the four weeks last preceding the date of the directions coming into force may be consumed in any week after such date. There are qualifying clauses in this respect. For the purpose of this part of the directions, the term "coal" includes coke, briquettes, and any other solid fuel of which coal or coke is a constituent.

The succeeding part applies to coal stocks, and gives the necessary instructions to the District Coal and Coke Supplies Committees.

The fifth part prohibits the shipment of coal from any port, unless permission is first obtained from the Secretary of Mines.

Part VI.—Gas Manufacture.

22. All persons who supply gas, whether under statutory authority or otherwise, shall use the coal required for the production of gas in

such a manner as to effect the greatest possible saving in the consumption of coal.

23. With the object of maintaining a supply of gas at adequate pressure during such periods of the day or night when the effective use of it by consumers is most needed, persons who supply gas, whether under statutory authority or otherwise, shall supply the same at other periods of the day or night at pressures so much lower than those prescribed under any special Act or Order applying to their undertaking as may be best calculated to secure a supply of gas at adequate pressures during such first-mentioned periods.

24. All persons supplying gas shall notify the local authority of the district by notice in writing, and shall notify their consumers by newspaper advertisements and placards, of such periods of the day and night during which the pressure of gas will be insufficient to permit of its effective use in consumers' fittings and apparatus.

25. Where any person supplying or offering to supply gas for reward is by reason of the provisions of these directions prevented by making a supply or from making a full supply of gas of any prescribed quality to any consumer, such person shall to that extent be relieved of any obligation, whether created by statute or otherwise, to make such supply.

Part VII.—Lighting, Heating, and Power.

26. All lights of the following classes and descriptions shall be extinguished, and such lights shall not be lighted at any hour except as provided in Article 27 hereof:

(*a*) Sky signs, illuminated facias, illuminated advertisements, and other lights used on, in, or about any premises for the purpose of advertisement or display;

(*b*) Lights used inside any shop for the purpose of advertisement or display, other than lights maintained solely for the protection of property.

27. It shall be the duty of local authorities to provide that the consumption in their respective districts of gas and electricity for any public lighting shall be reduced to the minimum that may be deemed necessary, provided that such public lamps as the Chief Officer of Police directs to be kept in use for the public safety shall be maintained as he may direct.

28. Where gas or electricity is required for power in any premises within the scope of Part III. of these directions, its supply and use shall be restricted so that not more than 50 p.ct. of the weekly average quantity supplied or used for power in the period covered by the last reading of the meter preceding the date of these directions coming into force shall be supplied or used in any week after such date, saving as may hereinafter in these directions be provided; provided always that where it is shown to the satisfaction of the local authority that the said weekly average does not afford a fair criterion of the quantity normally supplied or used in any such premises, regard may be had to the average weekly quantity supplied or used in such premises during the period in the year 1920 most nearly corresponding in date to that in which power is required, and such quantity may be deemed to be the weekly average for the purpose of these directions.

29. Where it is deemed by a local authority expedient in the public interest to do so, the percentage named in the preceding article may be increased, and the local authority or its duly authorized officer shall in such case issue a permit in writing specifying the extent to which the percentage may be increased, and stating the grounds upon which the issue of such permit is deemed to be in the public interest.

30. Any permit given as in the preceding article provided may by notice in writing be cancelled or varied by the local authority or its duly authorized officer or by the Secretary for Mines, and the quantity thereby authorized may be increased or may be reduced to any figure not less than 50 p.ct. of the said weekly average; provided that the said quantity may only be increased where it is deemed to be in the public interest to do so, and that the ground upon which such increase is deemed to be in the public interest shall be stated in such notice as aforesaid.

31. The person responsible for the management of an industry or business on any premises within the scope of Part III. of these directions, whether as owner, occupier, or manager of the premises, or in any other capacity, shall furnish to the local authority, if and when required to do so, a true and complete return showing what quantities of gas and electricity respectively were supplied or used for power in such premises during any period or periods as to which information may be required.

32. The local authority or its duly authorized officer may direct that any supply of gas or electricity, whether for light, heat, power, or any other purpose, in any premises, whether industrial, business, domestic, or of any other description, be diminished or cut-off where there is reason to believe that the supply is being abused or used in excess so as to prejudice the interests of the public. Any such direction shall be in writing, and a copy shall be served upon the owner or occupier of the premises to which the direction relates.

Any person who contravenes any of the provisions of these directions, or who neglects or fails to comply with any requirement or obligation imposed on him by any of these directions will be guilty of a summary offence against the Emergency Regulations, 1921.

Dr. Carpenter on the Regulations.

"More Carefully Thought Out."

In the "Daily Telegraph" yesterday morning the following appeared in an article on "Lighting Economy:"

Public loyalty in the interests of the nation will be an important factor in coping with the crisis which threatens the country. A great deal depends upon public economy, and the demands made on such undertakings as gas, electricity, and water. The directions of the Board of Trade in regard to the manufacture and supply of gas are regarded by gas companies as infinitely more satisfactory and practical than any previous Order. Dr. Charles Carpenter, the Chairman of the South Metropolitan Gas Company, said they bore signs of being much more carefully thought-out, and they were based upon the experience of previous crises. Quality and pressure of gas, he explained, must be maintained according to standard. If the pressure were reduced, Streatham, six miles from the Company's works, would be in darkness; while the neighbourhood immediately surrounding the gas-works might be amply supplied. Heavy pressure was always required at cooking-time, but at other times of the day it was the common practice to reduce the pressure. It is left to householders to consume as little gas as they can possibly do with. There is no specific restriction put upon the private user; but there is a general power to deprive him of a supply if, in the opinion of the local authority, the gas is being wasted. In regard to the suggestion of curtailing street lighting, Dr. Carpenter said it was important that the lighting should be maintained at its present strength. "I say that in the interests of the security of the public," he continued, "especially having regard to the fact that the times are more critical than they have ever been. Our street lighting is only 2 p.ct. of our consumption. There has never been an excess of public lighting in the suburbs."

PERSONAL.

In their annual report, the Council of the Midland Junior Gas Association place on record their appreciation of the services of Mr. W. H. Dean, who served the Association well as Secretary, and congratulate him on his obtaining the position of Assistant Manager at Todmorden.

At this week's meeting of the Monifieth Town Council, Mr. John Smart was appointed gas manager for the burgh. Mr. Smart is at present assistant gas manager at Hawick. He commenced his career with the Kelso Gas Company seventeen years ago. During the war he served with the Royal Engineers.

OBITUARY.

The death occurred yesterday (Tuesday) week of Mr. J. Duncan Royal, the General Manager and Secretary of the Watford Gas and Coke Company. Mr. Royal was apparently in good health the previous day; but the following morning he complained to his wife of feeling unwell; and, as he was preparing to go to the office, he collapsed and died almost immediately. Although his relatives and intimate friends knew that he had for many years suffered from an affection of the heart, his death in such circumstances came as a great shock to them. The deceased was born at Arbroath in 1872, and was educated at the High School there. He studied chemistry at the Dundee Technical School, and started his business career as a clerk at the Arbroath Gas-Works—subsequently being appointed assistant manager. In 1897, he went to the Watford Gas Company as assistant to Mr. Rowell, the Secretary of the Gas Company, on whose retirement in 1901 he was appointed Secretary. When Mr. A. H. Godwin, the Manager of the Company, died in 1908, Mr. Royal was given the post of General Manager and Secretary. He carried out his duties with very considerable ability; and the Directors had the greatest confidence in him. He was also held in high esteem by his colleagues and the men employed at the works. The funeral took place last Saturday at Watford Cemetery.

Mr. Herring's Severance from Edinburgh.

The following communication has been addressed by the Town Clerk of Edinburgh to Mr. Herring, under date of the 29th ult.: "The Corporation have now considered the question of the re-organization of the staff of the gas undertaking; and they have resolved:

(1) To appoint Mr. Gracie as Engineer and Manager, on the retiral of Mr. Masterton.

(2) To terminate the arrangement under which you act as Consulting Engineer of the gas undertaking.

The Corporation, in coming to this resolution, express their regret that, owing to the re-organization of the gas department, your long connection with the Edinburgh gas undertaking will now be terminated, and have resolved to record in their minutes an expression of the appreciation of the distinguished services rendered by you to the Gas Commission and latterly to the Corporation."

Fixtures of the London and Southern District Junior Gas Association for this month comprise a visit on Saturday next to the Beckton works of the Gas Light and Coke Company; the annual dinner and concert at Anderton's Hotel, Fleet Street, on Saturday, April 16; and a lecture entitled "A Man's Work," by Mr. John Terrace (the Engineer of the South Suburban Gas Company) on Friday, the 29th.

The Manchester and District Junior Gas Association are holding their twenty-first annual meeting at Bolton next Saturday afternoon, when they will inspect the installation of Woodall-Duckham vertical retorts in course of erection at the Gas Street works of the Corporation. The formal business will be transacted after tea at the Pack Horse Hotel, at which the members will be entertained by the Chairman and members of the Gas Committee and Mr. W. J. Smith, B.Sc. (the Engineer and Manager).

THE RELATIVE EFFICIENCY OF GASES IN HIGH-TEMPERATURE HEATING.

By E. A. W. JEFFERIES (Mass., U.S.A.).

[These Notes were an Addition to the Paper on "Gas Making with Cheap Oxygen" reported last week, p. 806.]

THERE are two factors governing the relative efficiency of burning gases, as measured by the percentage of their total heat which can be imparted to the substance to be heated. These two factors are (*a*) the flame temperature, and (*b*) the heat-carrying capacity of the products of combustion.

Flame Temperature.—The rate of transfer of heat to a substance depends on difference of temperature; consequently higher flame temperature gives faster heating and uses proportionally less fuel. Not only so, but the effective heat is that portion only which is above the temperature to which the substance has to be raised. For example, we may burn cold producer gas for ever in a Siemens furnace and never melt the charge. It is only when superheated so as to raise the flame temperature sufficiently high that any useful effect is produced; and the efficiency (that is the quantity of substance heated or melted by a given amount of fuel) is directly in proportion to the temperature of the flame above that necessary to impart to the charge. Hence a gas of high natural flame temperature is much more efficient for high-temperature heating than one of lower natural flame temperature, even though the latter may have a greater total heat value in B.Th.U., because the former functions more quickly.

This important matter is illustrated in the case of the oxy-acetylene gas-flame, whose utility is wholly dependent upon its temperature. It accomplishes a lot of very useful work with comparatively little expenditure of heat, because its flame temperature is extremely high. The flame temperature of water gas or steam-oxygen gas is about 12·5 p.ct. higher than that of natural gas.

Heat Waste.—The hydrocarbon gases waste three times as much heat to the atmosphere in the products of combustion as is wasted by either carbon monoxide or hydrogen, from the same cause which reduces their flame temperature—namely, from the fact that they require about four times as much air to burn them. Hence the commercial gas which contains the highest proportions of carbon monoxide and hydrogen is the most efficient for practically every purpose. That is to say, it will deliver the most heat into the substance to be heated in the shortest time, and will waste the least.

These facts can be illustrated by again comparing natural gas with water gas, or with the 400 B.Th.U. gas studied in the paper. For example, if the furnace temperature in any given operation is such that, using the latter gas, the chimney carries off 200 B.Th.U. per c.ft. of combustible (*i.e.*, one-half its original value) which is a very moderate loss in the majority of industrial uses, then under the same temperature conditions the loss from this cause when using natural gas would be $200 \times 3 = 600$ B.Th.U. In the first case, 200 B.Th.U. per c.ft. would be left in the furnace, in the second case 400 B.Th.U. per c.ft., in the same time. But in the first case, due to the higher flame temperature, the rate of heating is approximately 25 p.ct. faster, which means that 25 p.ct. fewer B.Th.U. have to be fed into the furnace to obtain the desired result. This is, instead of twice as much of the leaner gas being required, the ratio is only 3 to 2, whereas the original heat content of the two gases is in the ratio of 5 to 2. This simple calculation, which is borne-out by actual observation, shows the folly of buying gas by the B.Th.U. content.*

In the very large percentage of operations where the loss to the chimney is a still greater proportion (that is, where a higher temperature is required), the relative effective heating value of the leaner gas comes nearer equality with the richer and may even in some cases surpass it, foot for foot. It is only where gas is used for raising steam, in which case the products of combustion pass to the stack at comparatively low temperature, that there is any near approach to equal efficiency in the two gases. But even in this extreme case, the richer gas does not figure by this simple method more than 80 p.ct. as effective per B.Th.U. with a clean boiler and about 75 p.ct. with the average boiler. No measurements of the ratios in actual practice are known to the author.

The electric furnace is another extreme illustration of these phenomena. We all know that as a means of generating heat the electrical method is the most wildly extravagant agency conceivable, as not more than 5 p.ct. of the original energy of the fuel used to generate the current can be delivered as heat in the furnace. Yet this small amount of heat is applied so efficiently (that is to say, at so high a temperature and with so little waste to the atmosphere) that there is practically no further loss, and the electric furnace serves a most useful purpose in industry notwithstanding its initial extravagance.

The industrial gas of the future discussed in the paper not only possesses greater effective heating value per B.Th.U. than natural gas or than any other gas now used commercially, but in addition it has the advantage of costing less than one-half as much to deliver to the consumer as the present city gas.

Finally, this important matter of flame temperature, which is the basis of efficiency, is largely under our control, because, at no extra cost per foot of gas, we can introduce oxygen into the holder quite safely up to 5 or 6 p.ct. of the whole volume, and by this means increase the rapidity of combustion and flame temperature as far as is found practicable and profitable.

* This remark applies more particularly to comparisons with natural gas, which will inevitably be made in certain districts of the United States. Any effort to base values on B.Th.U. content in these districts would, for these reasons, be most unjust.

ALCOHOL FROM COKE-OVEN GAS.

THE last issue of the "Journal of the Society of Chemical Industry" reports that at a joint meeting of the Newcastle Section with the Cleveland Institution of Engineers, at Middlesbrough, on March 7, Mr. C. F. Tidman, in a paper on "Alcohol from Coke-Oven Gas," described further experiments which had been carried out at Skinningrove on the absorption of ethylene by sulphuric acid and its conversion into alcohol.

In a brief historical introduction it was stated that Hennell had published papers in 1827-28 on the production of alcohol from ethylene; and that he therefore deserved to rank with Wöhler as the first to produce an organic compound from inorganic constituents. A series of laboratory experiments was described which showed that the ethylene was most rapidly absorbed by sulphuric acid of 95·4 p.ct. at about 80° C. with turbulent contact; and it was deduced that nine towers, each 10 ft. diameter by 80 ft. high, would be required for the absorption of the ethylene contained in the coke-oven gas at Skinningrove, where 800 tons of coal are carbonized daily. Of these nine towers, the volume of six would be occupied by packing material.

In further laboratory experiments it was observed that when ethylene and sulphuric acid are shaken in a flask, the addition of silica increases the absorption by about 5 p.ct.; and it was concluded that whether absorption towers or mechanical washers be adopted for large-scale use, it should be possible to remove from 70 to 80 p.ct. of ethylene from the coke-oven gas by allowing a contact of 2½ to 3 minutes between it and the sulphuric acid. Mr. E. Bury found that 18 p.ct. of the sulphuric acid put into circulation was available for ethylene absorption—*i.e.*, that a 95 p.ct. acid would continue to absorb until its concentration was reduced to 77 p.ct. Further work has shown that the absorption can be carried still further when a mechanical agitator is used. The great advantage of a mechanical washer over a tower-scrubber system is the much smaller size of the plant required.

The recovery of the alcohol from the reaction mixture was found to be best effected by distillation with steam under reduced pressure; the bulk of the alcohol being obtained as a 15 p.ct. concentrate. After rectifying up to 87 p.ct., it gave good results when used as motor fuel. The alcohol obtained by this method contains various impurities—including diethylene disulphide and a yellow oil of unknown composition, the former of which is due to the action of the hydrogen sulphide present in the coke-oven gas; and a method of eliminating it has been worked-out which consists in treating the coke-oven gas with a large excess of sulphur dioxide solution on the counter-current system; the excess of dioxide being removed by subsequent scrubbing with water, and used over again. That pure alcohol can be made from coke-oven gas is certain; but it has yet to be done on a commercial scale. By using purified coke-oven gas and alcohol recovered by distillation under reduced pressure, it should be possible to obtain an 80 p.ct. conversion of the absorbed ethylene; and by using an acid stronger than 95 p.ct. it should be possible to obtain a higher ethylene absorption than 70 p.ct.

Prior to the meeting (at which over 150 were present) a visit was made to the Bye-Product Works of Messrs. Sadler & Co., Ltd., at Middlesbrough.

Southern Association of Gas Engineers and Managers.—The new President (Mr. J. Wesley Whimster, of Bath) will deliver his inaugural address at the meeting of the Association which is to be held to-morrow [Thursday] afternoon, in the Connaught Rooms, Great Queen Street, W.C. The election will also be proposed as an honorary member of Mr. James W. Helps, M.Inst.C.E. Luncheon will precede the meeting.

Coal Conveyance by Pipe-Line.—During the discussion of sundry problems connected with fuel, its conservation, storage, transportation, &c., at the annual meeting of the American Society of Mechanical Engineers, says the "Technical Review" (quoting from the "Iron Age"), mention was made of a proposal to bring coal to New York from the anthracite regions of Pennsylvania, by forcing it through two 14-in. pipes by water pressure. There is a fall of some 2000 ft. between Scranton, distant 130 miles, and New York. Coal and water in the proportion of 50 p.ct. each would, it is estimated, travel at the rate of 7 ft. per second. The two pipes would convey 7 million tons of coal per annum to the city, which would cover the requirements of the population of 5½ millions, and leave a balance for the supply of communities *en route*. The cost, it was asserted, would be small compared with the total cost of coal transported as freight.

GAS-WORKS RETURNS OF LOCAL AUTHORITIES.

Official Figures for the Year Ended March 31, 1920.

About four months ago—that is to say, in the "Journal" dated Dec. 1 [pp. 506-7]—some figures were given from the latest publication of the Board of Trade Returns relating to Authorized Gas Undertakings in the United Kingdom. But these referred only to Gas Companies. The corresponding statistics with reference to undertakings belonging to Local Authorities have now made their appearance; and it is therefore possible to complete our summary, which the simultaneous publication of the two returns used to enable us before the war to cover in one number of the "Journal." The present issue of the Local Authorities' Returns [Cmd. 1210] is in continuation of Parliamentary Paper No. 312 of Session 1915, which was for the year ended March 31, 1914. The figures are now brought up to March 31, 1920. Notice of the returns for the former year will be found in the "Journal" for April 18, 1916 [p. 124]. At a later date, an announcement was made by the Board of Trade to the effect that they did not propose to publish the returns for 1914-15. But a summary was made by the Board of certain of the particulars contained in the returns; and this was reproduced in the "Journal" for July 18, 1916 [p. 108]. Between that time and the present issue, in consequence of war-time conditions, no further figures made their appearance.

The undertakings with regard to which particulars are to be found in the present returns number 311 (excluding five undertakings not furnishing returns). In 1913-14, the number was 312. Those that have dropped out on the present occasion are the Devonport Corporation, the Ellesmere Port and Whitby Urban District Council, Liverpool Corporation, Ynyscynhaiarn Urban District Council, Ellon Corporation, Ballinasloe Urban District Council, Kilrush District Council, and Limavady Urban District Council. The new comers are: The Ashbourne Urban District Council, Biddulph Urban District Council, Bourne Urban District Council, Horsham Rural District Council, Plymouth Corporation, Porthcawl Urban District Council, Portmadoc Urban District Council, Skegness Urban District Council, Spenborough Urban District Council, Bridge of Allan District Council, Inverbervie Corporation, Motherwell Corporation, and Lurgan Urban District Council. Of the total number of 816 authorized undertakings included in the returns, 505 are in the hands of companies, and 311 belong to local authorities.

The total amount of local authorities' loans and the capitalized value of annuities authorized is put at £50,665,739. For 1913-14, the figure was £48,612,203. The amount borrowed, including annuities (not deducting amount repaid) appears as £48,165,805; while in 1913-14 it was £44,554,222. The loans repaid, annuities redeemed, and amount in sinking fund are respectively £24,518,078 and £18,380,960. The receipts for the last three years of which particulars are available are shown as: 1919-20, £22,776,613; 1914-15, £11,993,881; and 1913 14, £12,206,595. The expenditure is: 1919-20, £20,230,061; 1914-15, £9,658,194; and 1913-14, £9,661,310. The following table will enable these figures to be compared with those of earlier years:

Financial Position Summarized.

Year.	Amount Borrowed, including Annuities (not deducting Repayments).	Receipts.	Expenditure (exclusive of Amount in the Next Column)	Interest, &c., Paid.*	Net Profit after Payment of Items in Preceding Column.
1904-05 .	£38,512,295	£9,546,682	£7,052,474	£1,738,682	£790,450
1905-06 .	39,401,896	9,636,107	7,085,710	1,799,094	798,210
1906-07 .	40,089,167	9,843,243	7,211,987	1,843,122	832,341
1907-08 .	40,712,159	10,500,416	7,839,122	1,882,427	827,454
1908-09 .	41,435,988	10,506,480	7,998,776	1,905,810	659,445
1909-10 .	42,002,322	10,398,263	7,710,985	1,970,241	767,961
1910-11 .	42,490,504	10,829,758	7,902,451	1,963,015	973,934
1911-12 .	43,108,248	11,184,000	8,161,944	1,990,756	1,045,057
1912-13 .	43,681,976	11,910,340	8,799,164	1,980,247	1,157,674
1913-14 .	44,554,222	12,206,595	9,661,310	1,995,441	719,561
1914-15 .	†	11,993,881	9,658,194	†	†
1919-20 .	48,165,805	22,776,613	20,230,061	2,179,164	367,388

* These figures include: (1) Interest paid on loans; (2) amount paid for annuities; (3) amount of loans repaid; (4) amount paid for redemption of annuities; (5) amount placed to sinking fund.

† Information not available.

In 1919-20, the total quantity of coal carbonized by the local authorities was 6,437,015 tons; in 1914-15, 6,847,822 tons; and in 1913-14, 6,853,325 tons. The quantity of gas made for the three years was: 1919-20, 88,739,630,000 c.ft. (excluding 1,140,397,400 c.ft. bought in bulk); 1914-15, 84,104,515,000 c.ft.; and 1913-14, 82,265,530,000 c.ft. The quantity of gas consumed was: 1919-20, 82,544,688,000 c.ft.; 1914-15, 78,068,257,000 c.ft.; and 1913-14, 76,299,274,000 c.ft. These figures, with those of earlier years, will be found set out in the table. The total length of mains belonging to the local authorities was in 1919-20, 16,030 miles; and in 1913-14, 15,402 miles. In 1919-20 the number of public lamps supplied was 272,612; and in 1913-14 it was 366,647. The figures for the total number of consumers, it will be seen, are: 1919-20, 3,029,538; 1914-15, 2,955,315; and 1913-14, 2,888,248.

The 3,029,538 consumers were divided-up into 1,623,186 ordinary and 1,406,352 prepayment; while of the 82,544,688,000 c.ft. of gas sold, 57,113,453,000 c.ft. was for the ordinary consumers, 23,242,512,000 c.ft. by prepayment meters, and 2,188,723,000 c.ft. for public lamps. In addition to the total named, 112,867,000 c.ft. of gas was sold in bulk.

Working Statistics.

Year.	Tons of Coal Carbonized.	Cubic Feet of Gas Made.	Cubic Feet of Gas Sold.	Number of Consumers.
1904-05 .	5,622,259	63,335,696,000	58,324,570,000	2,148,260
1905-06 .	5,758,180	65,081,109,000	60,559,280,000	2,250,919
1906-07 .	5,923,476	67,312,153,000	62,726,524,000	2,339,914
1907-08 .	6,166,473	69,786 988,000	64,649,698,000	2,434,183
1908-09 .	6,112,569	69,933,629,000	64,640,679,000	2,516,927
1909-10 .	6,049,788	70,616,963,000	65,352,790,000	2,590,270
1910-11 .	6,161,702	72,903,220,000	67,491,765,000	2,666,146
1911-12 .	6,203,171	75,053,780,000	69,549,124,000	2,743,376
1912-13 .	6,489,268	78,485,145,000	72,920,576,000	2,813,860
1913-14 .	6,853,325	82,265,530,000	76,299,274,000	2,888,248
1914-15 .	6,847,822	84,104,515,000	78,068,257,000	2,955,315
1919-20 .	6,437,015	88,739,630,000*	82,544,688,000	3,029,538

* Including 9,908,229,000 c.ft. of water gas and 95,522,000 c.ft. of "other gas;" and excluding 1,140,397,400 c.ft. bought in bulk.

The information contained in the returns is, as on the last occasion, set out in twenty-three columns. Under "Nature and Quantity of Other Materials used for the Manufacture of Gas," various local authorities, as was the case with the companies in their recent returns, give the quantity of coke used, in addition to oil, and in some instances without oil. The Colne Corporation used 300 tons of coke and breeze; Darwen, 242 gallons of benzole; Leigh, 1575 gallons of crude oil; Manchester, 552 gallons of benzole; Rochdale, 614 tons of breeze; Yeovil, 400 gallons of gazine; Birmingham, 2669 gallons of benzole; Coventry, 3650 tons of breeze and 540 tons of coke dust as briquettes; Portsay, approximately 7 tons of carbide of calcium; Perth, 207 gallons of benzole.

Stockport purchased 20,019,000 c.ft. of gas; Chesterfield, 1,473,000 c.ft.; Southend, 14,647,300 c.ft.; Rickmansworth, 38,024,000 c.ft.; Denton, 3,083,200 c.ft.; Thornton, 328,100 c.ft.; Nottingham, 85,586,000 c.ft.; Southborough, 28,941,300 c.ft.; Little Hulton, 23,799,000 c.ft. from the Brackley Coke-Works; Mynyddislwyn, 21,440,600 c.ft.; Bedwellty, 22,262,000 c.ft.; Neyland, 6,272,300 c.ft.; Newcastle-under-Lyme, 393 000 c.ft.; Batley, 4,965,600 c.ft.; Burley-in-Wharfedale, 14,978,000 c.ft.; Hipperholme, 4,780,000 c.ft.; Kingston-upon-Hull, 72,309,000 c.ft. from the British Gas Company; Middlesbrough, 708,204,000 c.ft.; Rotherham, 30,645,000 c.ft.; Swinton and Mexboro', 38,247,000 c.ft.; Wath, Bolton, and Thurnscoe, 75,137,000 c.ft. The Portsoy Corporation made 72,000 c.ft. of acetylene gas.

The following table shows the maximum and average percentage of water gas sent out by local authorities manufacturing this form of gas:

Authorities Stating Percentages of Water Gas Supplied.

*Aberdeen [max., 12·93; av., 6·38].
Abertillery [max., 44; av., 26].
Accrington [av. (water gas and steaming), 10].
Ashford [max., 49·8; av., 13·3].
Barrow-in-Furness [max., 30·3; av., 6·3].
Barry [max., 40; av., 30·73].
Belfast [max., not stated; av., 26·64].
Birkenhead [max., 56·41; av., 34·68].
Birmingham [max., 30 to 40 est.; av., 20, est.].
†Blackburn [max., 22·48; av., 18].
Blackpool [max., 25; av., 10 75].
Burnley [max., 44; av., 25·8].
Carlisle [max., 19·4; av., 4·9].
Chelmsford [max., 21; av., 11·74].
Colne [max., 25; av., 18].
Conway [max., 40; av., 30].
Coventry [max., 33·97; av., 26·11].
Denton [max., 35; av., 27].
Devizes [max., 50; av., 20].
Doncaster [max., 23; av., 19·3].
‡Dundee [max., 12·47; av., 5·8].

* For year ended July 31, 1919.
† For year ended March 25, 1920.
‡ For year ended May 15, 1919.

*Edinburgh [max., 28·91; av., 13·92].
Halifax [max., 18·5.; av., 12].
Hebden Bridge [max., 3, av., 3].
†Johnstone [max., not stated; av., 25].
Kingston-upon-Hull [max., not stated; av., 33].
Lancaster [max., 7; av., 7].
Leeds [max., 21·2; av., 14].
‡Leicester [max., 35·61; av., 22·71].
Leigh [max., 14; av., 0·34].
Lincoln [max., 33·3; av., not stated].
Longton [max., 20; av., 15].
Loughborough [max., 30; av., 25].
Macclesfield [max., 36].
Manchester [max., not stated; av., 25·19].
Mansfield [max., 36; av., 15·8].
Marple [av., 20 to 25, est.].
Milford Haven [max., 18; av., 14].
Neath [max., 40; av., 27].
Nelson [max. 5·3; av., 0·95].
New Mills [max., 24; av., 10].

* For year ended May 15, 1919.
† For year ended May 15, 1919.
‡ For year ended Dec. 31, 1919.

Newton-in-Makerfield [max., 40; av., 31].
Nottingham [max., not stated; av., 3·46].
Oldbury [max., 60·5; av., 33·9].
*Oldham [max., 47·5; av., 25].
Ossett [max., not stated; av., 18].
Plymouth [max., 66·3; av., 49·9].
Pontypridd [max., 50: av., 7].
Rochdale [max., 44·38; av., 28·21].
Scunthorpe [max., 47·21; av., 35·86].
Smethwick [max., 31·7; av., 8·7].
Southport [max., 19·98; av., 10·06].
Stafford [max., 25; av., 25].
Stockport [max., 35; av., 26].
Stockton-on-Tees [max. 43·9*; av., 20·9].
Stourbridge [max., 41; av., 29].
Tipton [max., not stated; av., 3·7].
Todmorden [max., 20; av. 3·2].
†Torquay [max., 45; av., 36·6].
Walsall [max., 35; av., 22·06].
West Bromwich [max., 27·66; av., 11·66.]
Widnes [max., 29·9; av., 25].
Wigan [max., 35; av., 18].

* For year ended March 25, 1920.

* During railway strike.
† For year ended Dec. 31, 1919.

It is pointed out in the returns that the average percentages of water gas supplied do not in all cases correspond closely with the relative quantities of water gas and of coal gas made. It is understood that the figures showing the coal gas made include in such cases water gas not produced separately from coal gas; while the figures showing the water gas made relate to water gas produced separately from, and subsequently mixed with, coal gas. The total make of water gas in 1919-20 was 9,908,229,000 c.ft.; in 1914-15, 6,432,739,000 c.ft; and in 1913-14, 5,386,488,000 c.ft.

Combined Returns of Local Authorities and Companies.

The figures given below are the totals under the main heads for the two classes of undertakings.

	Number of Authorized Undertakings included in Return.	Amount Authorized.	Paid-up and Borrowed.	Receipts.	Expenditure.	Quantity of Coal Carbonized.	Quantity of Gas Made.	Quantity of Gas Sold.	Length of Gas Mains.	Number of Consumers.	Number of Public Lamps supplied with Gas.
		£	£	£	£	Tons.	Thousand Cubic Feet.	Thousand Cubic Feet.	Miles.		
Companies' return .	505	*125,687,368	101,812,631	43,037,484	39,134,309	10,596,697	160,826,784	145,880,443	24,079	4,510,595	273,100
Local authorities' return	311	†50,665,739	48,165,805	22,776,613	20,230,061	6,437,015	88,739,630	82,657,555	16,030	3,029,538	272,612
Total	816	176,353,107	149,978,436	65,814,097	59,364,370	17,033,712	249,566,414	228,537,998	40,109	7,540,133	545,712

* Share capital and loans authorized. † Loans authorized.

ELECTRICITY SUPPLY MEMORANDA.

So far as Kingston-on-Thames is concerned, the question of retrospectively increasing charges for electricity has been settled—in favour of the consumers. But it has not determined the main point of whether the Electricity Commissioners are acting *ultra vires* in allowing increases of charge to antedate the issue of the Order empowering an increase. Kingston, we believe, is not the only case in which this has been allowed; but it is the only instance we know of in which there has been an attempt to put it in force. Under the Statutory Undertakings (Temporary Increase of Charges) Act, the Commissioners have the power to allow in the case of local authorities up to a 50 p.ct. increase in the maximum charges for electricity; and to all intents and purposes, if they permit the increase of charge to be retrospective, it appears to us that they are exceeding their powers, which only become effective from the date that they issue their Order, to which date the then existing statutory maximum price is the one that applies. So far as Kingston is concerned, the Corporation Lighting Committee seem to have been impressed by the strength of the objection taken to their extraordinary method of augmenting the finances of the electricity undertaking by charging extra for current already consumed, and for which a statutory maximum (which had not been altered) existed. Litigation was threatened, and apparently the Lighting Committee were not particularly satisfied as to the strength of their own case. They therefore instructed the Town Clerk to take the opinion of counsel (Mr. A. M. Latter); and as was seen by our news columns last week, Mr. Latter's advice to the Council was not to enforce the retrospective increase, but to start operating under the new powers as from Jan. 1. Counsel did not in his "opinion" discuss the legality of the matter—as to whether or not the Electricity Commissioners had the power through the Minister of Transport to sanction a retrospective increase, and as to the interpretation of the Order that was actually made. But his admissions that the points raised by the case were of "considerable difficulty," and that there was quite sufficient doubt as to the points involved to make it wise for the Corporation in the circumstances not to insist on enforcing the order, show quite amply the conviction of the legal mind that the Council would be embarking on dangerous waters to carry the matter to the Law Courts. The opinion has been formally referred by the Council to the Lighting Committee, but Councillor Cheyney, the Chairman of that Committee, on the occasion, quite frankly accepted the opinion. Thus an end is put to a matter that has created much feeling in the town, but which has been marked by some humorous incidents, one of which was that the Corporation Finance Committee refused to pass the account for public lighting at the increased rate! Such recusancy on the part of an important Committee of the Council satisfied the recalcitrant private consumers that they were objecting in good and powerful company.

Fiasco of the Retrospective Increase.

It is clear that the municipal bodies who believe in the joint electricity authority schemes want things very much their own way. Evidence of this has been seen from time to time. It is observed again in the report of a Special Committee of the Association of Municipal Corporations who have been investigating the No. 2 Electricity Supply Bill, which seems at the moment to be hung-up, and not one of the favourites of the Government. The keynote of the report is relaxation for the joint authorities, so that their monetary obligations are spread over longer periods. In the first place, the Special Committee desire an amendment of clause 1 of the Bill in respect of the borrowing of working capital during the "first three years" after the establishment of the joint authority. During that time they think the authority may be more of an advisory and controlling body; and that the need for working capital will arise later. They next suggest that power should be given to capitalize interest during construction. There is objection to the payment by joint authorities of the salaries, pensions, and gratuities of the Electricity Commissioners and their staff. The Association state that it is entirely contrary to ordinary practice for the expenses of a Government Department to be borne by local authorities. What about the Gas Referees and the Chief Gas Examiner and the machinery set-up under the Gas Regulation Act? The gas industry has to bear all these expenses; and it has raised no objection to meeting charges that appertain to its own work. Then the Association do not like the compulsory form of clause 13 of the Bill. This provides that the prices to be charged by a joint authority are to be fixed subject to the directions of the Electricity Commissioners, so that the receipts shall cover the expenditure; and it is further proposed to enact that "a scheme constituting a joint electricity authority may include provision for contributions by the companies and bodies represented on the joint electricity authority or otherwise, as the Commissioners may think necessary for meeting any temporary deficiencies." This compulsory addition to the clause was deemed to be necessary by Sir Harry Haward, one of the Electricity Commissioners, to meet, for instance, a case where (say) most of the constituent authorities agreed to contribute to a deficiency, and one or two of them dissented. In the 1919 Act, there is provision for the payment for new constructional work out of money advanced by the Treasury. This is the famous provision of twenty million pounds. The Act proposes that, at the expiration of two years after the establishment of a joint electricity authority, the works so built are to vest in the authority, subject to the repayment of the sum advanced by the Treasury. The No. 2 Bill proposes that the sum shall be repaid (instead of in two years) by, if required, instalments spread over a period not exceeding five years. The Association are intending, when the Bill comes along, to press for fifteen years in lieu of five. The whole object of the clause in the Bill is to find ready money for the authorities, until they can raise the money to repay the Treasury. Apparently the Association's view is that Government money is as good as any other; and, once the joint authorities have got hold of it, they will prefer to repay as leisurely as they can. They can get still more leisure for repayment by raising money in the ordinary way, if they like to pay adequately for it. There are other suggested amendments by the Association, but they have no particular concern for us.

Relaxation of Obligations.

To many electric supply companies, as in the case of many gas companies, the obtaining of new capital is a source of much trouble. Of course, there is no great difficulty if a high rate of well-secured interest is offered; and the only way to make such an offer at the present time is by redeemable stock. Naturally capital at a high rate of interest is a bad thing for the consumers; but continuity of supply and progress of business are important, and capital must be obtained by some means. It is no use in these days appealing to consumers to provide new capital at a low rate of interest. Why should they? They are paying, relatively to pre-war times, a

Provision of Capital by Consumers.

high price for electricity; and money they have to invest can command elsewhere good rates of interest. So good rates of interest must be offered even to consumers to secure their financial support. Gas undertakings have a large number of pre-war share and stock holders who are consumers; but they have now to offer high rates of interest in order to obtain from them additional capital as required. An article appears in "Electrical Industries" on "Co-Operative Finance in Electricity Supply," from which it is seen that small and even "good-sized" electricity companies are finding themselves faced with a serious predicament on this score. The suggestion is made that serious attention should be given to the question of getting consumers to take an increasing interest in their local electricity companies. It is true consumers are directly concerned in the proper efficiency of the undertaking supplying them. "Consequently, there is at least a *prima facie* reasonableness in their being looked to to give financial support to their undertaking." Admitting this, they will only give this support on terms; and there has been a vast change in conditions since pre-war days. The reason companies are hard-up for additional capital is because they cannot afford competitive terms for it, or are loth to saddle their concerns with expensive capital. The writer of the article suggests that the "hard-up-for-capital" companies should call meetings of their consumers (especially the big ones) to talk over matters. He feels that nothing would be lost by such a step; and there does seem to be the possibility of some support at least. It is well to be optimistic; but every time we come up-against the hard fact that, even with consumers, it must be all a question of terms.

The Candid Critic. There are some electrical engineers who suffer from the delusion that for every unit of electricity expended in domestic heating, 3420 B.Th.U. are given off to the room as useful heat; and they therefore believe that they can claim 100 p.ct. efficiency for their heaters. Of course, people who have studied heating by electric radiators know that with equal inputs of current, there is a wide difference between the effective efficiencies of various types of radiators. The Electrical Engineer of Tynemouth (Mr. C. Turnbull) suffers from no such delusions. We learn from "Electrical Industries" that he condemns electric radiators which do little beyond providing hot air for the benefit of the ceiling, and states that radiators are now on the market which are designed to give out their energy as radiant heat; and the efficiency of these is very greatly in excess of the older type. There is no claim there of 100 p.ct. efficiency—in fact, he looks forward to the time when the inefficient radiators will be withdrawn from the market, and that will be "when our means of testing and imparting knowledge are improved." The gas industry has some very good means of testing, as developed at the Leeds University. It is confessed by Mr. Turnbull that inefficient radiators are still widely advertised and sold; "thereby wasting fuel and disappointing users." We have met with several such users; and all the electric radiators on the market are prodigal wasters of the original fuel—coal. Our contemporary thinks Mr. Turnbull may find himself up-against some experts in his advocacy of all-radiant heat. Mr. Turnbull can always refer to the practice of the sun in this respect. The slow progress of electric cooking is attributed by him to the cost of the ovens. There are past users who could tell Mr. Turnbull a thing or two about the branch of the business which he calls "electric cooking," other than as to the one feature of the high initial cost of the ovens.

Immersion Heating of Liquids. The water-heating problem for the electricity industry is still unsolved. When one thinks of the efficiencies and costs of other water-heating appliances—gas and coke—the marvel is that there are electrical men who devote time to dabbling in devices for this purpose. It is a waste of time for the men, and a waste of money for those indulging in the use of the devices. Water heating by electrical means has been one of the most prolific fields of false hopes, which practical experience has quickly and not any too respectfully buried. In the search for something practical, electrical men have lately been turning their attention to the immersion type of heaters—the method of use being explained by the description. Not long ago more than one speaker in a discussion at the Institution of Electrical Engineers considered that a *desideratum* of the electricity industry at the moment was an appliance which would boil a small quantity of water quickly. The "Electrical Times" has recently been referring to the matter. It admits, as many users will do quite willingly, that electric hot-plates are liable to maltreatment which considerably lowers their efficiency. And their efficiency is not high when in their pristine beauty, before various liquids have done their best to corrupt them. However, our contemporary thinks that the immersion type of heater possesses many good features. We should not like to use such heaters for all liquids, for they come from duty in some in a very messy condition. Because the heater is below the surface of the liquid to be heated, it is said that the transfer of heat to the latter is "necessarily" 100 p.ct. Furthermore, it is stated that this figure is not affected by use. We do not know just what this means. Nor do we know of saucepans, casseroles, or other liquid-heating vessels that are proof against heat losses; and how the lids of the vessels are kept tight, using an immersion heater, we are not aware. Our contemporary shows one, which looks something like a round knife-sharpener, with a stout wire guard to protect the heater from mechanical damage. It is said the loading is only 250 watts, and that this is sufficient to boil a pint of water from cold in about ten minutes. That is a physical impossibility. Ten minutes' use of the heater would mean the expenditure of 41 watts, which has a potential heating value of 140 B.Th.U. A pint of water, starting cold at 48°, would require 205 B.Th.U. (without loss by friction) to raise it to boiling-point. What is the use of making exaggerated claims?

For Larger Service. In a previous issue, the "Electrical Times" describes as "a vexed one" the problem of electrically heating water in sufficiently large quantities for everyday domestic use. It claims that a good make of electric geyser has an efficiency well over 90 p.ct.; but the difficulty is in the application. The high loading that an instantaneous heater must have is not liked by the supply engineer; and there must be a limit to the number of such appliances installed in any one district. Various heat storage systems that have from time to time been devised depend largely for their successful application on the quoting of a specially low rate per unit; but such proposals have not found any great favour. Our contemporary describes the "Aqua" heater, which is of the geyser type, and has a loading of 6·6 kw. This, it is confessed, is a big consumption for a domestic appliance, judged by present-day standards. Our contemporary says that the heater should appeal to the electricity consumer on account of its compact size; but we are doubtful about its effectiveness of appeal on account of cost. We are told the capacity of the heater is 75 gallons to 100° Fahr. per hour; and, as already stated, the loading is 6·6 kw. To raise 75 gallons, or 750 lbs., of water from (say) 48° to 100° in an hour would need 38,500 B.Th.U. at 100 p.ct. efficiency. The potential heat value of 6·6 kw. is 22,572 B.Th.U. The last few words of the previous paragraph again apply.

Gas-Heated Gun and Shell Furnaces.

Surface combustion high-pressure gas-furnaces installed at the Watertown Arsenal of the United States Government have exceeded in their results the expectations of the metallurgists and engineers. The gun furnaces, said Mr. P. J. Lafore, of Boston, in a paper presented to the New England Association of Gas Engineers, have competed with both electricity and oil, and have shown their superiority in a very marked degree. The gas is supplied to the gun plant at 10 lbs. pressure. There are a 37-ft. furnace and two 12-ft. furnaces of the cylindrical pit type, with tiers of burners placed all round them; and a general heat-treating furnace divided into two chambers, and under-fired, with the burners placed on two opposite sides. In the hardening plant there are six cylindrical furnaces used for heat-treating 14-in. armour-piercing shells; one shell being heated at a time. The burners are placed in tiers around the furnace; and the shells treated have broken records in Government tests. The furnaces are used for both hardening and drawing heats; and it is necessary in each case to have different temperatures in different parts of the furnace at the same time, in addition to maintaining a perfectly constant temperature at each point. Besides this, it is necessary to keep the nose of the shell cold on the draw; and water is continuously run through the bottom of the furnace over the nose during the heat. The furnace is divided into three zones—one above the other—with a series of burners encircling it in each zone. It is found possible to maintain a perfectly uniform temperature in each zone, and at the same time to have a difference as great as 100° C. between the top and bottom zone—a distance of some 3 ft.

Conveyors for Emptying and Filling Purifiers.—The People's Gas Light Company of Chicago last year installed five Barber-Greene conveyors, with which, and nine men, the time taken in emptying and re-filling the purifier-boxes with oxide has been reduced from twelve days to six. Eighteen men with wheelbarrows were required to do this work in twelve days, previous to the installation of the machines. At that time (when wages were not quite so high as now) all the work was contracted for at $800 per box, and at $500 per box with the machines. There are sixteen purifying-boxes at the works, each having a capacity of 12,000 bushels of oxide. When the box is opened, a conveyor is placed partly inside, to feed the string of receptacles which take the oxide to any part of the storage yard, and pile it there.

Storing Compressed Gas.—In connection with a renovation scheme for small gas-works at Greenville (Mich.), the 12,000 c.ft. gasholder was repaired, and two steel tanks were added to the storage capacity. These tanks are 8 ft. by 40 ft., with dished heads, triple riveted on the longitudinal seams, and made from $\frac{1}{4}$ in. steel, with $\frac{1}{2}$ in. steel heads. They were tested for 100 lbs. air and water pressure. A compressor draws gas from the relief holder, so to speak, and forces it into the storage tanks at pressures of from 30 to 80 lbs. The gas is subsequently released through a governor into the distribution system at 7 in. water pressure. No individual house-governors are used. With this plan, and new retort-benches, the Company have been able so to increase their productive and storage capacity as to have plenty of gas at all times. The system is working well.

AN AMERICAN GAS PURIFICATION INVESTIGATION.

By W. A. Dunkley and C. E. Barnes.

For several years, the Illinois State Geological Survey Division the Engineering Experiment Station of the University of Illinois,, and the U.S. Bureau of Mines have been carrying on a co-operative investigation of coal and coal-mining methods in the central district, which includes the States of Illinois and Indiana, and the western end of Kentucky. One division of the main investigation is the use of the coals of this district in gas manufacture. A number of bulletins have been published dealing with various phases of the subject. Gas purification, the topic discussed on the present occasion, is a phase of the subject which has an important bearing on the use of coals in gas manufacture with the existing equipment and operating methods.

One of the chief problems confronting the gas operator in using coals of the central district in place of gas-coals from Pennsylvania, West Virginia, and Eastern Kentucky, is the increased amount of sulphur which must be removed from the gas before distribution. This increase may be small or large, according to the particular coal used; but even the central district coals of lowest sulphur content usually contain more sulphur and yield more to the unpurified gas (whether coal gas or water gas) than do the best low-sulphur gas-coals from the regions mentioned, or the cokes made from these coals. Recognizing this condition, it was decided to make a study of existing purifying conditions in the gas-plants in Illinois, to ascertain to what extent the use of low-sulphur central district coals would overload the purifying equipment now installed, and where changes in equipment, operating methods, or purifying materials might be necessary to enable the various plants to purify the gas from central district coals economically, should other conditions make more extended use of these coals desirable. The problem was assigned to W. A. Dunkley, gas engineer of the State Geological Survey Division; and an inspection trip was made by him to sixteen gas-plants. The plants visited comprised nearly all the medium-sized plants of the State, including the suburban plants at Chicago.

In visiting the various plants, an effort was made to secure as detailed information as possible in the time available regarding load factor, size and arrangement of equipment for cleaning and purifying the gas, gas storage capacity, fuels used, and purifying methods employed. A few simple tests were made in each plant to determine the sulphur content of the unpurified gas and the amount of tar entrained in the gas entering the purifiers. Samples of spent purifying material and unused material were collected wherever possible, in order that information to be gained from the chemical analysis of these materials might supplement information available from inspection of the plants and conversation with the operators. At all stages of the inspection, hearty co-operation was given by the gas men interviewed, and much interest was manifested by them.

With the opening of the college year 1919-20 at the University of Illinois, C. E. Barnes, research graduate assistant in gas engineering at the University, was assigned to assist Mr. Dunkley in this study. Mr. Barnes devoted most of his time to the analytical work involved in studying the purifying materials collected during the inspection of the various plants.

A summary of the results of these studies and a statement of the conclusions that seem warranted follow.

Summary.

To summarize briefly, the following purifying conditions were found to exist in the plants inspected:

1. Low-sulphur eastern gas-coals were being used in practically all the coal-gas plants inspected. These low-sulphur coals, together with the considerable percentages of water gas made in most of the plants, gave an average H_2S content in the gas entering the purifiers of only 250 grains per 100 c.ft.

2. Six of the eight straight water gas plants inspected were using low-sulphur Illinois or Indiana coals for generator fuel. The average H_2S content in the unpurified gas in the water-gas plants was 140 grains per 100 c.ft.

3. In spite of the generally low sulphur-content of the gas to be purified in all the plants, 75 p.ct. of the water-gas plants and 50 p.ct. of the mixed-gas plants had maximum hourly gas production in excess of the purifier capacities. The computed overloads varied from 11·5 to 177 p.ct.

4. Only two water-gas plants and one mixed-gas plant had average hourly productions in excess of the purifying capacity.

5. Overload in most cases was due to lack of uniformity of load on the purifiers. This in turn was due to the sharp peak-load and insufficient holder capacity. In some cases the load could probably have been materially reduced by a little more attention to the rate of pumping gas through the purifiers.

6. Tar in appreciable amounts was found in the gas entering the purifiers in nearly all the plants inspected. The spent oxide from all the plants contained some tar. The average tar content of spent oxides from water-gas plants was 6·9 p.ct. and from mixed-gas plants 3·6 p.ct. Tar seemed in some cases to be chiefly responsible for low sulphur absorption.

7. The spent oxides from mixed-gas plants had an average sulphur content of 37·4 p.ct., and those from straight water-gas plants had an average sulphur content of 21·7 p.ct. Overload and tar seemed mainly responsible for these conditions in some cases. In other cases, operating methods seemed the cause of these low absorptions.

8. Revivification in place was practised by most water-gas plants, but by few mixed-gas plants at the time of inspection. Only one plant revivified oxide in the off-box. Little trouble was reported in this plant as a result of the practice, and the operating costs were low.

9. Though several purifying installations are arranged for reversible gas flow, there seems to be little effort to realize the fullest advantage from this arrangement. The same is true of rotation of boxes.

10. Few operators keep purifying records from which the actual performance of a particular batch of oxide or method of operation can be definitely determined.

11. Few operators make any systematic quantitative tests on their purifiers to determine the performance of individual oxide batches. In several plants where the necessary testing apparatus is available, it is seldom used.

12. It seems that the greatest opportunity for immediate improvement in purifying conditions rests in the establishment of a simple but regular testing routine, together with better purification records. The analysis of fouled oxides for sulphur and tar, even if done by an outside laboratory, would, it is believed, be worth while.

13. Total purification costs for the year 1919 varied in the plants inspected from 0·5 c. to 2·25 c. per 1000 c.ft. of gas purified. Careful operation and good facilities for the handling of oxide were apparently responsible for low costs in several cases where the equipment was overloaded. Different conditions prevailing in different plants preclude the possibility of drawing comparisons as to the effects of load, &c., on costs.

14. Few different oxides are used in the plants of the State. It is believed that more experimenting on the part of gas companies, to find materials best suited to particular conditions, would be advantageous.

15. The use of low-sulphur Illinois and Indiana coals as water-gas generator fuels is general in the water-gas plants of the State. Though the sulphur content of the resulting unpurified gas is in some cases double that of gas from low-sulphur eastern cokes, the computed capacities of the purifiers are but slightly less in the former case.

16. Low-sulphur Illinois coals in coal-gas manufacture might decrease computed purifier capacities by 25 p.ct. in some cases, as compared with the gas-coals in use at the time of inspection. This decrease might be offset in a measure by more attention to the selection of oxides, by making the load on the purifiers as uniform as possible, and by more attention to tar removal and purifying operation.

17. In several cases it appears that coals of higher sulphur content could be handled if existing equipment were rearranged and made more flexible in operation. In a few cases additional purifying apparatus is badly needed.

The Purifying Process.

The purification of gas, by which in the narrower sense is meant the removal of the sulphur present in the form of hydrogen sulphide (H_2S), is accomplished by the same process in nearly all the gas-plants of the United States. It was discovered about 35 years ago that hydrated oxide of iron was a much more economical absorbent for this sulphur compound than slaked lime, which had been in use since the beginning of the gas industry. Oxide of iron does not remove sulphur compounds other than H_2S present in the gas; but since the gas from most American coals does not usually contain any excessive amount of the other sulphur compounds, it followed that purification with hydrated oxide of iron was adopted almost universally within a few years after its initial use for the purpose. Hydrated oxide of iron, when of good quality, not only absorbs a large amount of hydrogen sulphides, but also, after sulphiding (if exposed to the action of the oxygen of the air), undergoes a process of regeneration whereby iron oxide is again formed by oxidation of a considerable portion of the iron sulphides present, free sulphur being liberated. This process is usually called by gas operators revivification. After revivification the material is again in a condition to be used for purifying gas. Alternate sulphiding and revivification may be carried on until, with favourable conditions, the material may contain 60 p.ct. of sulphide. It is then usually incapable of absorbing more hydrogen sulphide, on account of the clogging action of the free sulphur and the formation of more or less inert iron compounds, and is replaced by new material.

The chemical reactions involved in the sulphiding and regenerating or revivifying processes are not known with absolute certainty. Various chemical equations have been written expressing the probable final reactions; but it is likely that many secondary reactions really take place which are decidedly more complex than those given in the text books. Since it is the intention to confine this bulletin to the practical working phases of the purifying process, no attempt will be made here to repeat these equations or to go deeply into the theory of the reactions. The reader is referred to the literature of gas manufacture and chemistry for existing information on the subject.

Factors Affecting Purification.

Efficiency and economy in gas purification depend upon three main factors—equipment, operating methods, and purifying

material. The effect of each of these factors is more or less determined by existing plant conditions. Perhaps the most important condition affecting plant conditions is the load factor. Load factor as applied to purification will here be designated as the relation between the volume of gas passing through the purifying equipment during the hour of maximum production and the rated hourly capacity of that equipment, as determined by its dimensions and from practical and theoretical considerations pertaining to operation with the usual purifying materials.

Formulæ for Gas Purifiers.

Since the advent of the gas industry, nearly twenty formulæ have been propounded for dimensioning gas purifiers. Many of these were based on the use of slaked lime, the predecessor of hydrated oxide of iron for purification. Many are indefinite in their terms and include an insufficient number of factors to make them really applicable to present conditions. The formulæ of the Steere Engineering Company of Detroit, which appeared about a year ago, is perhaps the most complete of all; and while there are still factors in it which will probably have to be introduced or changed when our knowledge of these factors becomes more complete, the formula is very useful and has been used in the computations of this bulletin. For the convenience of readers, the Steere formula and some information regarding its use are given in Appendix A.

Design of Equipment.

In designing purifying equipment for a given plant, a number of things must be considered. One of the most important is the output of the plant, both present and prospective. In spite of electrical competition, the output of most gas-plants is growing rapidly; in fact, many companies are experiencing difficulty in keeping-up with the demand for gas. It is important, therefore, to make the purifying equipment of ample size; but at the same time the investment is heavy, and the interest on a greatly oversized equipment may offset to a considerable extent the operating advantages which might be derived from extra large capacity.

Load Factor.

Another factor to be considered is the distribution of the load during the day. The rate of output of most plants is far from uniform. Indeed, it is not unusual for some plants to put out 10 p.ct. of their daily production during the hour of maximum load. And since storage capacity has not usually grown apace with output, it is frequently necessary to generate and purify the gas practically as fast as it is sent out. From the figures obtained from the inspection of sixteen gas-plants in Illinois, of which eight made straight water gas and eight mixed coal and water gas, it was found that the maximum volume of gas purified per hour in water-gas plants varied from 4·5 to 11·2 p.ct. of the maximum daily output, with an average of 7 p.ct., and in mixed-gas plants from 3·6 to 9·3 p.ct., with an average of about 6 p.ct. Since the complete absorption of hydrogen sulphide from the gas by iron oxide takes a measurable time, the purifiers must be so designed that even at the maximum rate of flow there will be ample time of contact between gas and oxide, even when the oxide is partially sulphided and inactive. As the laws of nearly every State require that the gas leaving the plant must at all times be free from any appreciable amount of hydrogen sulphide, the gas manufacturer must comply with this requirement by whatever means he may. Often when the purifying equipment is heavily overloaded or fuels run considerably higher in sulphur content than usual, compliance with the law is difficult and costly.

As an economic matter, the purifiers must be so designed that they will hold enough oxide to purify the gas completely at the maximum rate of flow for a sufficient time, so that it will not be necessary to handle the oxide too frequently. It is desirable that the oxide be allowed to remain in the purifiers long enough between revivifications to absorb a reasonable amount of sulphur. The labour cost of handling oxide is one of the heaviest items of purification cost; and it is therefore desirable that an oxide should take up a maximum amount of sulphur with the least cost of handling. This can be done by making the purifiers large enough—due consideration being given to investment charges.

Sulphur Content of Gas.

The sulphur content of the gas to be purified is another factor to be considered. The gas industry has always been a particular customer in the purchase of coal, and the sulphur content has always been an important specification where there was otherwise little choice between coals. Good gas-coals heretofore have contained not exceeding 1 p.ct. of total sulphur, and frequently the content of sulphur has only been 0·5 or 0·6 p.ct. The decrease in the supply of such superfine coals has caused gas operators to look about for possible new supplies; but while the industry will probably have to be reasonably particular so long as present purifying methods are in use, it will probably be necessary to use coals of higher sulphur content than would heretofore have been considered expedient. In water gas, not only the sulphur content of the generator fuel, but also the sulphur in the enriching oil must be considered. Purifying equipment consequently will have to be designed with these matters in mind.

The maximum permissible rate of gas flow through a system of purifiers does not vary inversely as the hydrogen sulphide content of the gas to be purified. Fig. 1, which is plotted from the Steere formula, shows the relation existing between maximum hourly rate of gas flow through the purifiers and the hydrogen sulphide content of the gas. The curve represents the maximum hourly purifying capacity, with various contents of hydrogen sulphide, of a plant which would have a capacity of 100,000 c.ft. of gas per hour, if the gas to be purified contained 200 grains of hydrogen sulphide per 100 c.ft.* It will be noted that if the sulphur content is multiplied by 5 (giving 1000 grains per 100 c.ft.), the capacity is reduced from 100,000 c.ft. to 66,500 c.ft. Capacity in this sense pertains, of course, to the hourly rate of gas flow permissible, not to the capacity of the oxide for absorbing H_2S. If the oxide in the purifiers could be completely fouled in either case, it is evident that five times as much gas containing 200 grains of H_2S could be purified. It is evident therefore that the permissible rate of gas flow through the purifiers is not directly proportional to the absorption capacity of the oxide nor inversely proportional to the sulphur content of the gas. The rate of the chemical reaction has an important bearing, but this is not taken directly into consideration in any existing formula for the design of purifiers, though it is indirectly allowed-for in the Steere formula.

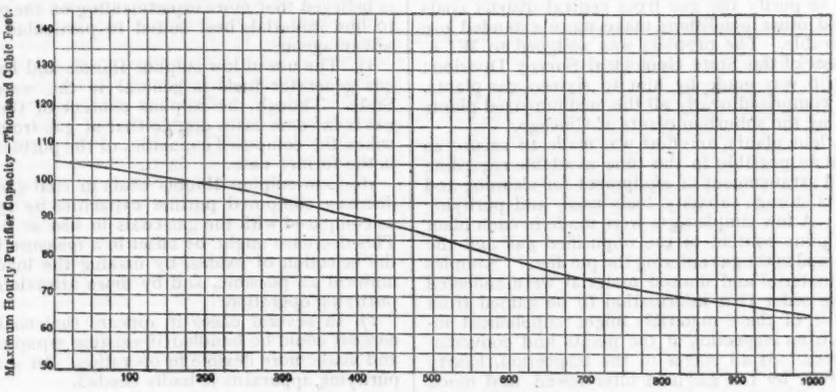


FIG. 1.—EFFECT OF HYDROGEN SULPHIDE CONTENT OF UNPURIFIED GAS ON PURIFIER CAPACITY, IN A PLANT HAVING PURIFIERS RATED AT 100,000 CUBIC FEET HOURLY CAPACITY, WITH GAS CONTAINING 200 GRAINS OF HYDROGEN SULPHIDE PER 100 CUBIC FEET.

Capacity of Auxiliary Equipment.

While the capacity of the oxide purifiers must be designed to handle the maximum hourly load, a properly designed system may fail to accomplish the complete purification of the gas, because of conditions existing in other units of the gas-cleaning apparatus. Under favourable operating conditions, the purifiers are not usually called-upon to handle all the hydrogen sulphide that was originally present in the gas when generated. Water and tar vapour condensing from the gas in the condensers and wash-water in the scrubbers all remove a certain amount of H_2S from the gas. In coal-gas plants, the ammonia present in the gas

* It may be objected by some that when the gas contains no H_2S at all the capacity of the purifiers would be infinite and that there should be consequently a sharp rise in the curve. Practically, however, as soon as there is any appreciable amount of H_2S present in the gas, the time-factor of the reaction between H_2S and hydrated oxide of iron comes into play, necessitating a very appreciable time of contact to purify the gas. It is often observed in practice that it is more difficult to remove the last 10 p.ct. of H_2S from the gas than the first 90 p.ct., emphasizing the fact that the permissible rate of purification is not inversely proportional to the H_2S content of the gas.

has a very important part in sulphur removal, since it combines directly with H_2S. There is not enough ammonia present to remove all the sulphur, but this incidental purification may remove as much as 20 to 40 p.ct. of the H_2S present in the gas. If the condensing and scrubbing apparatus is under-sized, not only is this incidental purification diminished, but the oxide purifiers are forced to do part of the work—namely, tar extraction—which should be confined to the first-mentioned equipment. Tar and oil vapours undoubtedly have a detrimental effect on the operation of the purifiers, since they coat the purifying material and render it partly inactive. Despite the recognized harmful effect of these vapours, there are few plants in which the gas entering the purifiers is entirely free from them, In some plants well equipped as to purifier capacity, this condition is responsible for poor purifying results. Tar removal before purification is very important as a matter of both equipment design and operation, and deserves more attention than it usually gets. Some kind of test by which the tar content of the gas entering the purifiers can be determined should be made regularly, where purifying results indicate the possibility of this trouble. Frequently a plant which seems to need additional purifying capacity is really in far greater need of more efficient tar-extracting apparatus.

(To be continued.)

A PROPOSED NEW MEASURE OF CALORIFIC POWER

IN REFERENCE TO WOOD, PEAT, AND LIGNITE, AND OTHER SUBSTITUTES FOR COAL.

By E. Damour.

A paper dealing with the economics of wood, peat, and lignite as substitutes for coal fuel appeared in a recent issue (January, Vol. V.) of "Chimie et Industrie" by M. Damour. It is a contribution to the more extended use of the fuel resources which France possesses in her forests, lignite deposits of the Landes and Dordogne, and abundant beds of peat. Though Sub-Committees of the Government Fuel Commission are engaged in investigating the respective fuels, M. Damour addresses himself particularly to two aspects of the question: (1) A more accurate specification of these fuels in respect to their useful calorific power; and (2) a review of what has already been accomplished in respect to their industrial use. He is of the opinion that their use now lies in the will to carry out any particular project; and that the means exist not only of relieving fuel difficulties but of developing a source of national wealth.

As a preliminary to discussing the use of fuels such as wood or peat, having the common feature of a high content of water combined or present as moisture, M. Damour dwells on the bearing of this water content, and particularly upon the need of a new thermal rating of fuels—viz., "industrial calorific power," the relation of which to existing thermal standards he first sets forth. In thermal measurements, the gross calorific power is, of course, the result ordinarily obtained—*e.g.*, with the Mahler bomb—and is the amount of heat produced by combustion at constant volume, water being condensed and the operation carried out at 15° C. or calculated to that temperature. An exact scientific measurement! But since in practice combustion takes place at constant pressure (the atmospheric pressure) and without condensation of the water which escapes with the other products of combustion, the net calorific power, as defined and calculated by Le Chatelier, has been employed for closer approximation to working conditions, since it corresponds with combustion at 15° C. at atmospheric pressure but without condensation of water vapour. It is, however, only a partial step from an impossible scientific measurement to one which can be realized under practical conditions, difficult to define as they are. Therefore M. Damour would now introduce an "industrial calorific power"—viz., a measure of the heat which can be produced in a furnace under working conditions.

In seeking to draw up a definition of it, he has to provide for the effect of water in the fuel—particularly in reference to wood, peat, and the like. Both gross and net calorific powers are determined on the basis of a dry fuel, according to conditions of drying defined by Mahler—the moisture present in any fuel acting negatively on combustion. This has to be got rid of by vaporization in order to obtain the effect of the fuel proper. That is to say, a deduction requires to be made from the figure of gross or net calorific power equal to as many times 596 calories as there are grams of moisture per kilo. of fuel. In practice, however, this vaporization never takes place at 15° C.; and therefore a further deduction from the figure indicated by the Mahler bomb must be made, corresponding with the calories employed in heating the vaporized water, the combined water, and the water produced by the combustion of hydrogen and hydrocarbons. And since the minimum of 100° C. is necessary in practice, and the waste gases escape into the atmosphere always at a higher temperature, still another deduction requires to be made in respect to the heating of the waste gases from 15° to 100° C. These considerations give shape to the "industrial calorific power"—viz., the net calorific power calculated from the dry to the moist fuel, and subjected to further deductions corresponding to the vaporization of water at 100° C., the heating from 15° to 100° C. of combined water and that formed by combustion, and the heating of the products of combustion from the lower to the higher of these two temperatures. This definition involves only one hypothetical factor—viz., 100° C. as the final temperature resulting from the combustion. That is to say, the industrial calorific power, measured scientifically, would be the figure indicated by a calorimeter working at constant pressure, supplied with air at 15° C., and discharging the products of combustion at 100° C.

The usefulness of determining industrial calorific power is illustrated specially in reference to fuels containing different and considerable proportions of moisture. Table I. does this for a wood containing from 0 to 20 p.ct. of moisture.

Table I.—*Calorific Powers of Wood containing from 0 to 20 p.ct. Moisture.*

Analysis of Sample Taken.

Carbon.	Hydrogen.	Oxygen.	Nitrogen.	Ash.	Moisture.
42·1	4·9	38·0	0·3	1·3	13·4

Gross calorific power of sample as above, 3975 calories.

Gross, Net, and Industrial Calorific Powers Calculated for Different Proportions of Moisture.

Water content (p.ct.)	0	5	10	15	20
Gross	4590	4360	4130	3900	3670
Net	4235	4086	3824	3564	3316
Industrial	4109	3963	3715	3448	3204

Experimental and Technical Data Employed in Calculating Above Calorific Powers.

(1) Composition of waste gases per kilo. of dry fuel:

Carbon dioxide	421 ÷ 12	= 35·1 molecules
Nitrogen	(35·1 × 4) + 0·1 + (0·75 × 4)	= 143·5 ,,
Water	49 ÷ 2	= 24·5 ,,

(2) Proportion of water in the waste gases in molecular volumes:

24·5	27	30	33	35·5

(3) Heat (in calories) of molecular rise in temperature from 15° to 100° C. of constituents of waste gases:

Carbon dioxide, 0·75; water, 0·70; nitrogen, 0·58.

Note.—These data supply all the material for the calculation of the calorific powers; the waste gases being reduced in proportion to the dry fuel. The total moisture is on the basis of the figures in (2).

The table shows that, in the comparison of a dry wood with the same with a 20 p.ct. content of water, the gross calorific power and the net and industrial values exhibit differences up to 1400 calories from the highest figure of 4590, or nearly 33·3 p.ct. The difference is still more marked in the case of lignites which may contain 30 to 55 p.ct. of water, and in that of peat, which in the freshly-dug state may have as high a proportion as 85 or 90 p.ct. Tables II. and III. show the great reductions in the net and industrial calorific values.

Table II.—*Calorific Powers of a Landes Lignite of Water Content 0 to 50 p.ct.*

Analysis of Sample Taken.

Carbon.	Hydrogen.	Oxygen and Nitrogen.	Sulphur.	Ash.	Moisture.
44·5	2·3	14·3	3·5	16·3	19·0

Net calorific power, calculated by Dulong's formula, 3650 calories.

Gross, Net, and Industrial Calorific Powers Calculated for Different Proportions of Moisture.

Water content (p.ct.)	0	19	25	50
Gross	4783	3874	3587	2391
Net	4340	3650	3336	2047
Industrial	4181	3514	3208	1947

Experimental and Technical Data Employed in Calculating Above Calorific Powers.

(1) Composition of waste gases from combustion of sample containing 19 p.ct. moisture—in molecular volumes per kilo.:

Carbon dioxide	446 ÷ 12	= 37·1	on dry fuel	46
Nitrogen	(37·1 × 4) + 1·1 + 11	= 160	,,	198
Water	11·5 + 10·5	= 22	,,	15

(2) Proportion of total moisture in the waste-gases for different degrees of moisture and proportions of other gaseous products of combustion:

Water	14	22	24·5	34·7
Carbon dioxide	46	37	34·5	23
Nitrogen	198	161	148	99

Sulphur compounds, present in insignificant proportion, are neglected.

(3) Heat per molecule for rise in temperature from 15° to 100° C.:
Carbon dioxide, 0·75; water, 0·70; nitrogen, 0·58.

Table III.—*Calorific Powers of a Peat of Water Content 6 to 75 p.ct.*

Analysis of Sample Taken.

Carbon.	Hydrogen.	Oxygen and Nitrogen.	Water.	Ash.
53·18	5·54	34·23	6·12	0·95

Gross calorific power, 5489.

Gross, Net, and Industrial Calorific Powers Calculated for Different Proportions of Moisture.

Water content (p.ct.)	6	25	50	75
Gross	5489	4385	2923	1463
Net	5182	4015	2491	889
Industrial	5015	3809	2334	786

Experimental and Technical Data Employed in Calculating Above Calorific Powers.

(1) Composition of waste gases per kilo. of fuel containing 6 p.ct. moisture:

Carbon dioxide $531{\cdot}8 \div 12$	$= 44{\cdot}3$
Nitrogen $(44{\cdot}3 \times 4) + 0{\cdot}3 + 28$	$= 205{\cdot}5$
Water 30	30

(2) Proportion of water in waste gases in molecular volumes;

30·1 .. 36 .. 42·4 .. 56·4

(3) Heat (molecular) for rise in temperature from 15° to 100° C.:

Carbon dioxide, 0·75; water, 0·70; nitrogen, 0·58.

Table II. thus shows the very great drop (from the maximum theoretical value of 4783 calories) which represents the unavailable heat under certain practical conditions of use. The fuel has only 40 p.ct. of its potential value.

In the case of peat, the calculations are of still greater importance, since they show that the calorific power descends to a point at which it is not enough to vaporize the water contained in the fuel. By drawing a curve of the industrial calorific powers from 6 up to 75 p.ct., it is seen that between 85 and 90 p.ct. the water content reduces the calorific power to *nil*. With peats of poorer composition and a larger proportion of ash, this point where combustion becomes impossible will sometimes be found to occur at 75 p.ct. of water.

M. Damour adds some observations as to the importance of "temperature of combustion" in considering the use of fuels of high water content. He uses the term as defined by Le Chatelier—viz., "the temperature to which the gaseous mixture of the products of combustion is brought on the presumption that combustion is instantaneous and takes place in a perfectly athermic space." The characteristic is a purely theoretical value. It is not the temperature of the flame, or even of the hottest flames; but nevertheless it is a value of industrial utility, since upon it depends the useful effect of a fuel or the efficiency of a furnace with a given fuel—what is described as the "*valeur d'usage*" of a fuel. The "temperature of combustion" is very greatly affected by the water content of a fuel, and by the proportion of water vapour in the products of combustion. The following calculated figures show the temperatures of combustion in the furnace of a boiler fed with wood containing different contents of vapour:

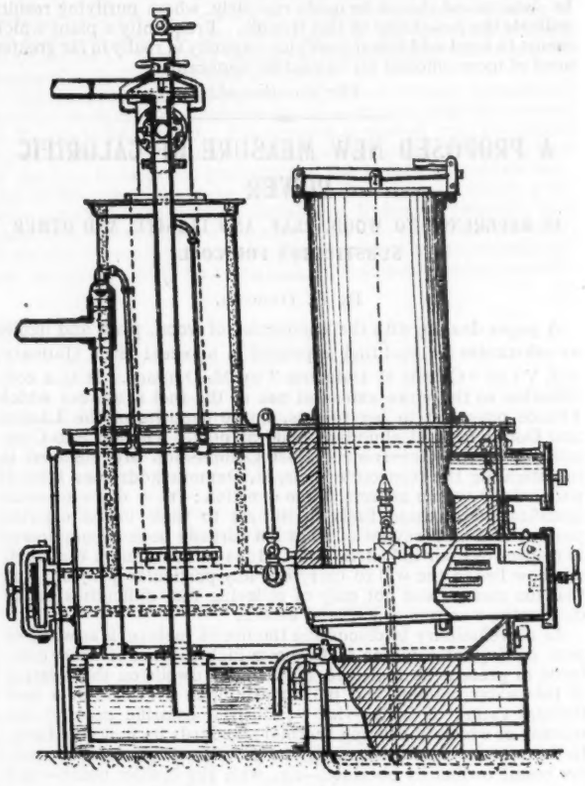
Water content (p.ct.)	5	10	15	20
Temperature °C. . . .	1835 ..	1785 ..	1740 ..	1700

The drop in temperature is more than 100° C. These and the foregoing considerations both signalize the inimical effects of the water content on the combustion of the fuels in question. Hence M. Damour insists on the need of expressing these effects quantitatively. He proceeds to discuss the means for overcoming the calorific inferiority of these substitute fuels.

Among technical means for utilizing hydrated fuels, the most obvious and also the most effective is previous drying. It cuts at the root of the evil, affecting both calorific power and temperature of combustion—that is to say, the total heat energy and its efficient employment, both factors which supplement each other. In the case of peat, it cannot be said that a practical method of drying has been evolved. But active measures are being taken in the direction of dehydration both by compression and by the use of recuperative drying chambers, and should lead to a successful issue, possibly in the near future. Drying of lignite, on the other hand, is not such a promising process, owing to the readiness with which the material disintegrates. Nevertheless, Cologne lignite, having 55 p.ct. of water, is employed in a partially dried state (with 12 to 15 p.ct. of water) as a conglomerate fuel, and gives ground for the hope that the large deposits in the south-west of France could be better utilized. In the case of wood, preliminary dessication on a Sturtevant drier or similar plant is altogether satisfactory, and results in a saving of 10 to 15 p.ct., as fully confirmed by the numerical records of its industrial employment.

The second means, applying equally to wood, lignite, and peat (preferably with its water content reduced to 40 or 45 p.ct. by air-drying), is gasification in any producer furnace, followed by condensation of the water in a washer. The system is by no means new, for it has been described by Vicaire in the "Bulletin de l'Industrie Minérale" in reference to its application in 1807 to a steel furnace, heated by a producer supplied with sawdust and wood refuse. It is a partial remedy, since it improves only the temperature of combustion but involves the loss in the producer of a part of the heat of vaporization, which is subsequently destroyed in the condenser. Still it has its merits, particularly if it is employed in conjunction with the heating of the primary air-supply of the producer by the heat (ordinarily wasted) of the gas. A variation of this system is embodied in the Vierzon producer of M. Goulet, in which the water generated by the progressive heating of the wood in the upper part of the producer escapes into the open air (as in carbonizing wood in retorts), with the result that the gas subsequently obtained by reversed distillation and combustion contains less water, and is readily dehydrated by a condenser. This form of the process has evidently been brought to a point of practical value.

The third system for the utilization of these fuels, and one which theoretically comes nearest to the maximum development of the heat units, is that of the Riché producer and the application of the principle of reversed distillation and of gasification in two stages; the products of distillation and primary combustion traversing a column containing fuel at a red heat. This is not the Riché producer for distillation in retorts, which is an installation consuming a large quantity of fuel outside the retorts, but a system of duplex combustion specially applicable to hydrated fuels. In the diagram of the plant, the furnace proper on the right serves for the use of any fuel, wood refuse, lignite, peat, &c., yielding carbon dioxide gas. On the left is a reduction chamber charged with coke or wood charcoal at the red heat of about 700° C., in which the water, tars, and carbonic acid of the first reaction are decomposed. By keeping-up the temperature in this second chamber, as is easily done by admitting secondary air between the two parts of the producer, a very satisfactory decomposition of the reducible constituents (tar, water, and carbon dioxide) is produced, with the result that by using most inferior fuels in the first furnace, a gas of 1000 to 1200 calories is obtained, containing only traces of water and free from tar—in other words, a



Duplex-Combustion Producer Furnace.

good producer gas. The importance of the system lies in the fact that it actually utilizes the heat of vaporization of the water from the inferior fuel, forming water gas in the second chamber, which is served by the first as by a boiler. It may be said that the fuel burnt in the first chamber is utilized in correspondence with its gross calorific power, since the whole of the water is converted into combustible gas, though the method calls for the consumption of a carbon fuel free from water (in proportion to the water content of the hydrated fuel) simultaneously with the direct combustion of the low-grade combustible. The system of double combustion in producer furnaces is not unfamiliar to engineers—the Riché principle is embodied in the Stockport and some other producers. But it requires skilful control of both the primary and secondary air supplies.

In conclusion, M. Damour expressed his opinion that the greater utilization of highly hydrated fuels has reached a practical stage. He mentioned the cases of several works, concerned respectively with the carbonization of wood, glass making, and metallurgy, in which coal has been wholly replaced by such fuels for the heating of retorts, and the supply of producers and reheating furnaces, without depreciation of output. Industrialists who have adopted wood have had no inclination to resume the use of coal, particularly the inferior coals now largely supplied. He regards the use of wood as a question to be investigated in common by the forestal and manufacturing interests in France; the development of forestry and the improvement of transport being essential matters.* For peat and lignite, he considers the possibilities somewhat more remote, yet is convinced that the technical obstacles to their use will be overcome.

* This question has recently been the subject of a communication (in the "Génie Civil," Dec. 19, 1920) embodying the reports of M. Walkenaer, Vice-Chairman of the French Fuel Commission, and of M. Cornu Thénard, reporter to the Sub-Committee, of which M. Métayer is Chairman. M. Damour expresses his agreement with many of the findings recorded in these reports.

JOINT VISIT OF SCOTTISH JUNIORS TO THE GRANTON GAS-WORKS.

The joint visit of the Eastern and Western Districts of the Scottish Junior Gas Association took place last Saturday week, when a party of a hundred inspected the Granton Gas-Works of the Edinburgh Corporation. They were met by Mr. Alexander Masterton (the Engineer and Manager), and were guided over the spacious works by his able assistants. The members had every opportunity of inspecting thoroughly the important details of the plant.

The Works Described.

Operations on the Granton site were commenced in 1898. The first section of the works was completed and put to work in October, 1902; while the second portion was finished in October, 1906. The site extends to 106 acres, and was purchased in 1897 for £124,000, which included various rights as to railway facilities, &c., representing a considerable monetary value to the Commissioners. The eastern boundary is fixed so as to admit of direct junction with the Caledonian Railway system. The estimated cost of constructing the works was stated by the Engineer to be at the rate of £45,000 per million cubic feet of daily producing capacity.

The retort-house is fitted with a complete installation of inclined retorts, capable of carbonizing approximately 1000 tons of coal per day. The retorts are Ω shaped, 20 ft. long by 22½ in. by 15¼ in., and are placed at an angle of 32° with the horizontal. The coal, discharged from end-tipping wagons by a hydraulic lever, is directed upon a steel traversing belt, and conveyed to the breakers. It is then fed to hydraulic elevators, and raised to the overhead bunkers. The bunkers, 168 ft. 6 in. long, contain a maximum of sixteen hours' storage, or 700 tons. Beneath the coal-bunkers, measuring chambers are fixed for exactly gauging the amount of coal required for one charge of each retort. The valves on both bunkers and hoppers are worked by hydraulic power. Portable shoots enable the charge to be placed in the retort. The coke is discharged through shoots into the trough of the hot-coke conveyor, sunk beneath the retort-house stage, water quenched, run over screens, and loaded direct into wagons ready for transport. Arrangements for storage are made when necessary.

The gas leaves the retort-house in four streams of 20-in. pipes, and is made to converge into two streams each in a 30-in. pipe. Batteries of three Clapham's water-tube tower condensers are in use. Each battery has a combined water-cooling surface of 8070 sq. ft., in addition to which there is an air-cooled surface of 1500 sq. ft.

The exhausting plant was supplied by Messrs. R. Laidlaw & Sons, Ltd., and comprises two complete sets with steam-engines common to both, and arranged so that the engine belonging to one set can be made to drive the exhausters of the other. There are four exhausters of the three-blade type, guaranteed to pass 200,000 c.ft. at a speed of 60 r.p.m. against 30 in.

There is a Humphreys and Glasgow water-gas plant, with two generators, each capable of producing 1,000,000 c.ft. of gas per twenty-four hours.

Cyanide scrubbers are in use; and the plant-house also contains apparatus for dealing with cyanogen solutions produced in the washer-scrubbers. Provision is made for producing sodium ferrocyanide cake or potassium ferrocyanide crystals.

The purifiers (water-lute type) consist of two complete sections, each of six boxes. Each section is divided into a set of four actuated by an eight-way Weck valve, and two catch-boxes are actuated by a four-way valve of the same type.

The gasholder is of 6,000,000 c.ft. capacity.

After the tour of inspection, the party were entertained at tea in the technical offices on the works—Mr. Masterton presiding.

Mr. D. Campbell (Anstruther), President of the Eastern District Section, in proposing a vote of thanks to Mr. Masterton and his assistants, said he was sure the Juniors were delighted with all they had seen that afternoon; and the Edinburgh Corporation were to be heartily congratulated on the efficient plant installed at Granton.

Mr. J. Jamieson (Greenock), President of the Western District Section, coupled his Association's thanks with those of the Eastern District, and wished Mr. Masterton many pleasant and happy days in his approaching retirement.

Mr. Masterton said it gave him great pleasure to have a visit from the Junior Associations. He was always keen to assist the younger generation in the gas industry, and was glad they had benefited by their visit to Granton Gas-Works. While the plant was in good condition and efficient, it was probably not thoroughly up-to-date, inasmuch as inclined retorts were still working; but it was probable that a vertical retort installation would be erected before very long. Commenting on the districts supplied from Granton, he mentioned that the gas was conveyed at high pressure by a 48-in. main, subsequently passing into mains of 24 in., 18 in., 15 in., and 10 in., to the Edinburgh, Leith, and Portobello gasholder stations. There are ten gasholders and 27 governors in use in the district; and the supply covers an area of 40 square miles. There are 108,000 consumers.

SCOTTISH JUNIOR GAS ASSOCIATION

(WESTERN DISTRICT).

At the Annual General Meeting last Saturday, Mr. John Frazer, the Manager of the Dalmarnock Gas-Works, Glasgow, delivered the following

VALEDICTORY ADDRESS.

Before entering upon the subject of my address, I would like, in the first place, to thank the President and members of Council for the great honour they have conferred on me, in asking me to deliver the address at the close of our seventeenth session. Personally, I have always looked upon the closing address as a stimulus to the members. Such an address, in my estimation, could only be expected from someone very prominent or outstanding in our profession. I am neither one nor the other—simply the choice of your Council. I therefore trust that my efforts to comply with their request will in nowise take away from the prestige of the occasion.

To deliver an address suitable for the occasion, the range of subject-matter is very wide and varied. I have, however, elected to direct my remarks to the young members on what, perhaps, one might call a personal matter. Be that as it may, I assure you that what I am about to say to you is said in all sincerity, with the hope that it may act as a foreword to all young men in general, and you of the Scottish Junior Gas Association (Western District) in particular. Being a junior of some years standing, and "a chiel o' many pairts," I at least believe I know what should be good counsel for young men. I therefore ask you to bear with me, and trust that what I have to say to you will be taken in the spirit in which it is given—that of goodwill.

EDUCATION AND TRAINING.

In dealing with my subject, I have refrained from making reference to either gas manufacture or distribution, and have reserved the right to choose that which I consider will be of value to the young members of the Association; and, quite naturally, my choice is "Education." How could it be otherwise, when we recognize that it is our thirst for knowledge that brings us together at our meetings and visits? Let us therefore hope that the educational part played by our meetings may be well sustained, and that members will avail themselves of the great opportunities afforded by the reading of papers and entering into the discussions thereon, as by so doing they will learn to speak in public, and will not be afraid of the sound of their own voices; thus giving them greater confidence when called upon to speak before a committee or a board of directors.

I take it for granted that most of the young members of the Association have high ideals, that their aspirations carry them to the topmost height of the profession, and that they are imbued with the thought that some day, at no great distant date, they themselves will be managers and leaders, not only of men, but of all things pertaining to the gas profession. To accomplish this, much thought and study are necessary in matters theoretical and practical. It is neither good practice, nor is it beneficial to the student, to do a certain piece of work by a particular method because someone else has done so. It is for you young men, as students, to ask the why and wherefore of everything in connection with the subject you are studying. Ask your superior, be he manager, foreman, or lecturer. In any case, get the knowledge, as there comes a time in your professional career when you are expected to know. It may be you are in a responsible position, and a problem arises with which you know not how to deal; your position preventing you asking advice from those around you—in fact, your prestige would be endangered by such a course. You therefore simply say nothing and look wise, trusting to the old-time method of muddling through somehow.

I beseech you young men, one and all, to make the most of your early training, as by so doing you are laying the foundation for your success in the future, with honour to the profession. I have been some time in this world now, and I have seldom, if ever, met the man who, being possessed of the knowledge sought after by the student, was so selfish as to refuse to answer a legitimate question when asked by one of junior rank. For some considerable time, we have been reading in the Technical Press about the training of the gas engineer, and detailed descriptions of his training, theoretical and practical; and the number of courses through which he must pass before he can hope to blossom forth as a full-blown gas engineer have been given. We have also had the same subject on this session's agenda, and, further, the Senior Gas Association of the country (the Institution of Gas Engineers) has also been interested in the question of education; evidence of its activity in this matter having been before our Association at the first meeting of this session—efforts, all of which are steps in the right direction. Let us, therefore, be unanimous in endeavouring to improve the status of the profession by every means at our disposal. This will take time to accomplish; and I implore all you young men to be prepared whenever the opportunity presents itself and to acquit yourselves like men. When I say like men, I mean in every respect. It is not sufficient to be well posted in all matters relating to our profession. There is as great, if not greater, education awaiting you in the largest school of all—*i.e.*, the world and its ways, with its many pitfalls, and its stern realities, from which you have been sheltered in virtue of your being a student.

It is on this part of your education that I wish to speak—viz., the equipment of the student for the battle of life—as there are no text-books on the subject that will help you to acquire the necessary knowledge of mankind and his methods. Once you step out to take your place in the business affairs of the world, you will encounter many difficulties which will be quite new to you, although well known to some of us. It has always been thus, and ever will remain—ever old, ever new. Education in such matters is confined to the two greatest teachers extant—*i.e.*, time and experience. You must therefore embrace every opportunity for improving your general knowledge of the affairs of the world as they present themselves from day to day. Cultivate common sense; keep your eyes and ears open; learn when silence is golden; be respectful and civil to all ranks; and you will gain respect and civility in return—a prize coveted by all true men.

THE POST-STUDENT DAYS.

Let me now take you a step further on, to what we shall call the post-student days, when the type of budding gas engineer, who, as a student, was always a plodder, has received his first appointment as assistant in some provincial works. He leaves the works in which he was trained with mixed feelings—at least, many of his kind have done so—with a certain amount of fear for the future, the thought being derived from the knowledge of very indifferent treatment meted-out to others who had gone before, by principals, who, perhaps unthinkingly, expect as much from a young man as they would get from a man of more mature years and ripe experience. Let us hope the type of principal portrayed will be more consistent in future, and give the rising generation at least a sporting chance.

Side by side with the plodder we have the impetuous type of student, over-confident of his own ability, who goes out as assistant, crammed full of new ideas, who, by his conversation, would like to impress you that once he has had the opportunity to develop them he will revolutionize the whole world of gas manufacture and distribution. To him I would like to give the caution, in "braid Scots," "gang warily," as care and discretion must be exercised in all new appointments. I give this advice in all seriousness, lest he stumble by the way.

It should always be borne in mind by the assistant that his first duty is to be loyal to his chief in all matters, carrying out his instructions to the letter; and his aim should be to work with him and for him, and not against him. However, all chiefs are not of the same temperament. The assistant may find himself serving under one who is of the blustering type, in whose presence he is overawed by the abrupt and disinterested manner in which his suggestions are treated, giving him the feeling that he has mistaken his profession, and in quiet moments making him pessimistic about the future. In such adverse circumstances, one is inclined to become a rebel. On the other hand, his principal may be one of the more common or modest type of men, saying little but thinking much. Should it be your lot to have the pleasure of serving such a one, I would impress upon you the necessity for studying his wants and desires. Consult him and obtain his views on the various problems arising from time to time; get conversant with his ways, his ideas, and his method of working. If such a line of action be taken, it will be for the good of all concerned.

A FEW DON'TS.

From my present vantage point I claim the privilege to suggest for the guidance of the aspiring assistant a few "don'ts." Don't allow yourself to be carried away with the idea that because your chief is of a retiring disposition he knows nothing. Don't estimate his value from the opinion of others, be they of the profession or otherwise. First get to know your man, then form your own opinion, the expression of which should be reserved for state occasions. Don't impose your ideas upon him unless he is agreeable to them, and voice them at the proper time. Should any good results accrue from your ideas when put into practice, don't forget who gave you the opportunity of carrying them out. Don't try to belittle or underestimate his value in any way. Don't advertise the fact that you are a smarter man than he, even if you think you are, or if, perchance, some one has been so unkind as to tell you so. Don't get suffering from swelled head; if you do, your downfall is assured.

Always remember that knowledge can only be gained by years of practice, and that it is only from experience and by our failures that we need hope to learn. It should always be borne in mind by you, that your chief takes the responsibility of any new venture. If he should therefore desire to take the major share of the credit, let him have it; it will surely do you no harm, provided he acknowledges to you personally his appreciation of your work, which, coupled with your share in the glory of its accomplishment, should urge you to further efforts. To gain and keep the respect of your chief, you should be diligent and untiring in your efforts for the efficient and good working of the undertaking you serve. Be truthful at all times, especially in matters concerning reports and similar subjects, as much worry and annoyance are caused by lackadaisical methods in such matters. They may look trifling at the time, but turn up in giant form later on.

THE DIFFICULT RÔLE OF ASSISTANT.

The position of an assistant, being as it is of subordinate rank, makes it a very difficult rôle to fill, and, carrying with it a good deal of responsibility, is subject to many a set-back from higher authority. It is therefore necessary that the assistant should be careful before giving a definite instruction, assuring himself that it is in keeping with the views and wishes of his chief and in the best interests of the concern.

You will doubtless observe from the foregoing that much more than the ordinary technical training is required before a student may hope to become a successful assistant, and far less a full-fledged manager. In the first instance the assistant must study the human element, which is one of the great factors in all undertakings, as, without a proper understanding between the management and the men, dissension and its evil effects will follow. It is therefore necessary for every person who has charge of men to receive their complaints and grievances, petty or otherwise, and deal with them at once, or, if outside his jurisdiction, pass them on instantly to the proper authority, intimating to the complainer that he has done so. Delay in cases of this kind are dangerous, and often lead to mistrust between managers and men, through neglect or indifference on the part of the assistant.

I would therefore caution all who aspire to such a position to be prompt in all dealings with men, keeping in mind the fact that they are just as anxious to have their wrongs righted as we on the other side of the counter are. One word more in this connection. I charge you one and all not to fraternize with your men. You can be quite friendly without being familiar; and I quote the old saying, "Familiarity breeds contempt." I give this word of warning, as the downfall of many an otherwise good manager can be traced to his being on too familiar terms with his men, he being a hail fellow in this case not well met—with disastrous results to himself.

In closing, I wish to make it quite clear that this address is given as a lesson from the school of experience for the benefit of young men starting out in life. If by its means I have been instrumental in convincing at least one of our number, that there is an education other than technical required before one can hope to be a success in the profession, I shall be satisfied that my effort in the cause of education has not been in vain.

GAS FOR PLATE AND ANGLE FURNACES.

Mr. H. H. Smith, of Massachusetts, describes a gas plate and angle furnace installed by his Company at a shipyard. It is of brick construction, with inside dimensions of 36 ft. 6 in. long, 5 ft. 8 in. wide, and 24 in. from the floor to the centre of the arch. The walls are 9 in. thick, with a 2-in. dead-air space between these outer walls and the silica brick inner lining. The entire furnace is lined with silica brick; while the floor is of this material laid on end, and embedded in high-temperature cement. Without this heat-resisting lining, the flames would soon burn through the arch. At the bottom of the side walls are 24-in. openings; but there are none in the arch. This form of construction pulls the heat to the bottom of the furnace, so that the maximum heat is produced from the fuel burned, and radiated on to the metal. Heated by burners on each side, the furnace consumes 15,800 c.ft. of gas per hour. The openings in the side walls through which the nozzles pass are made large, so as to keep the nozzles cool; the nozzle projecting only ¾ in. through its opening. All burner openings are flared on the sides and upper part, in order to direct the flames along the top of the furnace-arch; and by staggering the nozzles on either side, the whole of the furnace is in a glow when brought to its full heat. The heat is radiated on to plates and angles so that the flames do not at any time come in contact with the metal. This production of true radiated heat at a temperature of 1400° to 1800°, with entire absence of direct flame contact, leaves the material clean and clear, with very little scale. After the furnace has been lighted for fifteen minutes, steel angles 30 ft. long, 4 in. wide, and ½ in. thick can be fully heated in six minutes; while plates 20 ft. long, 5 ft. wide, and ⅜ in. thick are ready in twenty-one minutes.

Asbestos Covers for Tanks.—Jackets of steel and corrugated asbestos are being provided for five 65,000 barrel storage tanks, utilized as receptacles for light refined products, on the premises of the Marland Refining Company at Ponca City. The jackets will completely cover the tanks. Approximately 5 tons of steel and 3000 square yards of asbestos will be required for each one. The idea is that tanks protected by jackets are as nearly fireproof as it is possible to make them, and that the resultant saving in evaporation will soon pay for the jackets. The asbestos employed is identical with that used in roofing.

The annual general meeting of the Midland Junior Gas Association will take place to-morrow [Thursday] evening, in the Council House, Birmingham, when, in addition to formal business, there will be a paper by Mr. Frank R. Ayre, Publicity Assistant to the Birmingham Corporation Gas Department, on "Publicity in the Gas Industry."

The will has been proved of Mr. E. W. Drew, chartered accountant—one of the Auditors of the South Suburban Gas Company—who left property valued at £10,779. The estate of the late Mr. Thomas Waddom, the Secretary of the Newcastle-upon-Tyne and Gateshead Gas Company, who died last September, has been declared by the executrix (his sister) of the gross value of £3547, with a net personalty of £1673.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

The Caloriscope and the Brady B.Th.U. Indicator.

Sir,—I was very much interested in the description of the "Caloriscope" developed by the South Metropolitan Gas Company, as given in the Dec. 1, 1920, issue of the "Journal;" and I note with much regret the recent announcement of Mr. E. V. Evans, that they have not found the Caloriscope to work satisfactorily on gases other than straight coal gas.

I am thoroughly familiar with the Brady B.Th.U. indicator; and if the principles worked-out by Mr. E. J. Brady have been applied to the operation of the Caloriscope, it seems that there should be no reason why the instrument should not give a fair degree of accuracy with water gas, since there is a definite relation between the heating value and the percentage and composition of the illuminants in water gas. It occurs to me that perhaps the difficulty is due more to the operation of the instrument than to any inherent differences in the characteristics of the gases which would make it impossible to apply these ideas in a practical instrument.

In view of the difficulty which the designers have encountered, and for the reason that the matter is of somewhat general interest, I wish to call your attention to the results of recent experimental work directed by the writer, from which we have arrived at some conclusions regarding air-entrainment of gases of different densities.

The designers of the Caloriscope state that they secure a constant air: gas ratio to the burner, since "any alteration in the density of the gas is automatically corrected by a change in the inducing power." It is a fixed law that with the same orifice pressure the total momentum of a stream of light or heavy gas issuing from an orifice per unit of time will be the same; but since the rate of discharge varies inversely as the square-root of the density, the momentum per unit volume will be less for the lighter gas.

The air injection is dependent upon the momentum of the gas-stream. Increasing the volume of gas to a burner increases the pressure within the burner; and it requires a greater momentum of the gas stream to keep the air: gas ratio constant. Changing the gas volume by varying the pressure, the air: gas ratio will remain almost constant between 2 in. and 6 in. water pressure, unless there has been considerable change in the temperature of the burner.

From the curve given in the attached figure we find that at 30 c.ft. per hour the burner injected about 5·75 volumes of air with gas of ·65 specific gravity. With the same pressure, the same orifice would have passed 40·8 c.ft. of a gas of ·35 specific gravity; and the air injection would be reduced to about 4·3 volumes. From a large number of tests on industrial types of atmospheric burners we have arrived at a relation which we know holds good over a range of 2 in. to 6 in. orifice pressure. It is this: For any given burner, the ratio between the momentum of the gas stream and the momentum of the stream of the air and gas mixture entering the burner is a constant, irrespective of orifice pressure, specific gravity of the gas, or volume of gas entering the burner. From the description given of the Caloriscope, I do not see how "any alteration in the density of the gas is automatically corrected by a change in the inducing power" unless this is accomplished by some mechanical means not stated.

There is no doubt in my mind that the Brady B.Th.U. indicator can be modified so as to give practically instantaneous readings, such as are claimed for the Caloriscope; but any such modification will, of course, add considerably to the cost of the instrument.

Walter M. Berry, Gas Engineer,
Washington, March 14, 1921. United States Bureau of Standards.

The "Captive Fire" and Gaseous Firing.

Sir,—As you published a report of a lecture I gave at the Institute of Metals in 1917, together with an editorial note thereon [see "Journal," Sept. 25, 1917, p. 563, and Oct. 2, 1917, p. 29], will you allow me space in your columns to make the following remarks?

I have lately read with much interest your several reports of the Inerts and Carbon Monoxide Committees—particularly the evidence of Sir Dugald Clerk, which called to mind some figures of his, published in the "Proceedings of the Institution of Civil Engineers," Vol. 85, and from which a curve was constructed, that makes apparent the full significance of the figures from a gas-firing point of view, which has passed unnoticed these thirty years by gas engineers. Possibly the author of the figures himself is not to be excluded.

A 3 p.c. error on the reducing side of the curve can make a difference of 200°, and a 3 p.c. error on the oxydizing side, a difference of 350° in the temperature evolved.

Bearing in mind that an atmospheric burner can rarely, if ever (at the normal pressure at which gas is delivered) induce more than three times the amount of air to that of gas, unless secondary air is introduced by hazard or design, gas engineers will perhaps appreciate the necessary wastage of fuel incurred by the prevailing hit-and-miss style of gas-firing, and also the reason for my having spent twelve years to perfect a system which automatically controls mixture, without incurring the danger of running it into the mains.

A. C. Ionides.

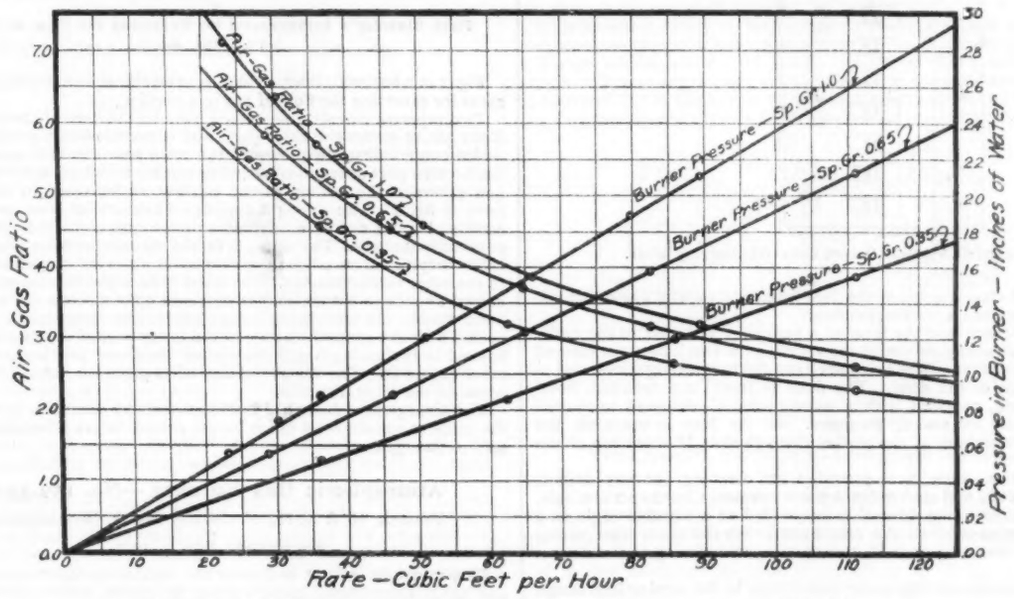
34, *Porchester Terrace, W., April 1, 1921.*

Meeting of the Inerts Committee, March 16.

Sir,—In your issue of March 23 there are two statements in my evidence, as reported, which I should be glad if you would allow me to correct—viz., (1) Page 756, second column, 29th line from the bottom: "6 or 7 p.ct. of carbon monoxide" should read "16 or 17 p.ct.," &c. (2) Page 757, first column, 2nd line: "This emphasized the point," &c., should read: "This emphasized the point that carbon dioxide was not so detrimental to flame temperature with a fairly high carbon monoxide content."

W. C. Goodchild.

Midland Railway, Derby, March 30, 1921.



Pipe Burner, 1¼ Inch Diameter. Port Area, 0·75 Square Inch Orifice. Pressure, 4·0 Inches.

AIR INJECTION WITH GASES OF DIFFERENT SPECIFIC GRAVITIES.

Wages in the Chemical Trade.—In their award on the recent application for increased wages by the National Union of General Workers for the London section of the chemical trade, the Industrial Court decided that no alteration should be made in the existing rates. The employers opposed any increase on the ground that the trade was passing through a period of acute depression.

Exmouth Gas Company.—Steady progress and the expectation of largely increased business were reported at the annual meeting, on Tuesday of last week, of the Exmouth Gas Company. The Directors regretted that, owing to the operation of the sliding-scale, the dividend allowed on the consolidated ordinary stock could not exceed 3¾ p.ct. per annum. It was proposed to apply to the Board of Trade to be allowed to revise the scale. The gas sales continued to show steady progress; and extensions to the plant at the works and mains in the district were being carried out. The Chairman (Rev. C. R. Carr) rejoiced to say that the relations of the Directors with those whom they employed had been cordial and sympathetic; and this blessing they owed to the good oversight of their Manager (Mr. Dean). If the coal trade and all that depended upon it would allow, there was a prospect of largely increased business. Mr. L. D. Thomas (the Vice-Chairman) remarked that it was a matter of pride to them that they had been able to increase and extend their carbonizing plant without calling for any addition to capital.

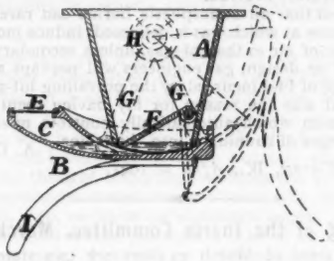
REGISTER OF PATENTS.

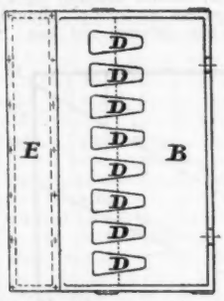
Water-Sealed Coke-Discharging Door for Vertical Gas-Retorts.—No. 159,108.

RAYNER, W. S., of Ipswich.

No. 12,099; May 1, 1920.

This discharge door includes a curved member so suspended as to be capable of being rocked alternatively beneath or to the side of the discharge hopper, so formed as automatically to effect the water-sealing of the hopper when the door is in the closed position, and provided with a pocket to retain the sealing water when the door is opened.





Rayner's Vertical Retort Coke-Discharging Door.

A sectional view is given of the door fitted to a vertical gas-retort discharge hopper and a plan of the door.

The mouthpiece is in the form of a hopper A attached to the under portion or extracting device of the retort, with two long sides tapered towards the bottom. The two ends have the bottom edges rounded to suit the shape of the door. The door B, itself, is a rounded, boat-shaped casting, provided with a water-pocket C, designed to contain sufficient water for sealing purposes. As the door is operated, the water flows in and out of the pocket through slots D in the top of the door.

An inspection cover E is provided for cleaning out any deposit which may get in and tend to block the waterways; but to prevent this, a false bottom or swing door F is suspended at a suitable angle on a rod which passes through the mouthpiece with the lower edge resting on the water retaining door B, and opening and closing as the door is operated.

The door is suspended from the mouthpiece by flat steel or iron straps G working on trunnions H, and is operated by a handle I.

Manufacture of Incandescent Gas-Mantles. No. 159,281.

WILSON, J., of Birmingham.

No. 28,769; Nov. 20, 1919.

This is another method of carrying out a former "invention" (described in patent No. 134,875, dated Oct. 10, 1918), and consists in taking a piece of fabric in stocking or tubular form and impregnating it with a solution of the nitrates of thorium and cerium, and after drying, dividing it into suitable lengths, preferably square or oblong in shape. A portion of one of the folded edges is then cut-out, leaving the corners intact, instead of (as in the former specification) cutting the edges entirely and re-joining the corners.

Reversing the Flow of Gas in Purifiers, Condensers, &c.—No. 159,261.

FIRTH BLAKELEY, SONS, & CO., LTD., of Leeds, and BLAKELEY, W., of Church Fenton.

No. 28,353; Nov. 15, 1919.

According to this invention, two separate casings are fixed on the front of the purifier, each covering two valve ports and comprising a flanged pipe communicating with one of the main gas inlet and outlet pipes. The valve ports of each pair are connected with an upper and a lower part of the purifier; and within each casing is an oscillating lever carrying at either end a lid or valve adapted to close one of the two ports—the arrangement being such that when one port is open the other is closed. The levers are linked by connecting rods, to which the required movement is imparted by a single hand-wheel, the operation of which opens the port connected to the lower part of the purifier box in one casing (the reverse action taking place in the other casing) so that the flow of gas is reversed. Glands are provided where the connecting rods pass through the casings.

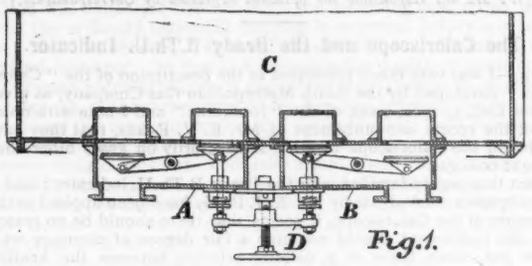


Fig. 1.

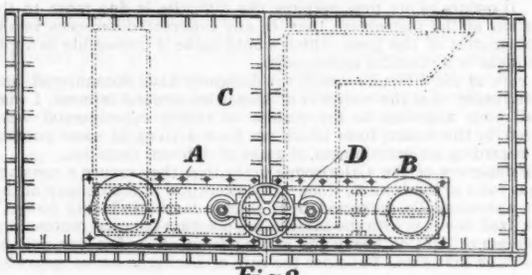


Fig. 2.

Firth Blakeley's Arrangement for Reversing the Flow of Gas in Purifiers, &c.

Fig. 1 is a horizontal section and fig. 2 an elevation showing the apparatus for reversing the flow of gas in a purifier.

Two separate casings A and B are fixed on the front of the purifier C. Each casing covers two valve ports and is provided with a flanged pipe which communicates with one of the main gas inlet and outlet pipes. Each valve port opens into a conduit certain of which open at the top and others at the bottom of the purifier, as indicated by the dotted lines in fig. 2. The casing A contains a two-armed lever carrying at each end a lid or valve adapted to open and close the first-named ports alternatively. The casing B in like manner contains a two-armed lever carrying valves adapted to operate in a similar manner in respect to the other valve openings. The inner ends of the two levers are connected by rods to a crosshead D mounted upon a screw on which is a hand wheel. On turning the hand wheel in one direction the port connected with the conduit leading to the lower part of the purifier box is opened in the casing A and the port of the lower part is closed in the other casing B. The reverse action takes place on turning the hand-wheel in the other direction.

The arrangement described is said to effect an economy, as it enables the oxide to remain for a much longer period before it becomes necessary to change it.

Atmospheric Gas-Burners.—No. 159,554.

PEMBER, H. & A. H., of Hockley Brook, Birmingham.

No. 27,047; Nov. 4, 1919.

This invention relates to means for regulating the mixture of gas and air in atmospheric burners either for stoves, cookers, fires, or for lighting purposes; the device being capable of easy insertion in the mixing tube of existing burners. It consists of a narrow strip or tongue capable of being inserted through a hole in the side of the mixing tube, and being adapted to be turned about its axis so as to be

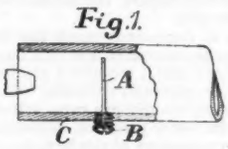


Fig. 1.

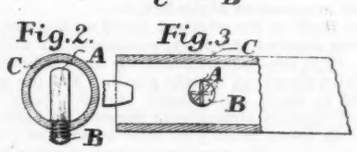


Fig. 2.

Fig. 3.

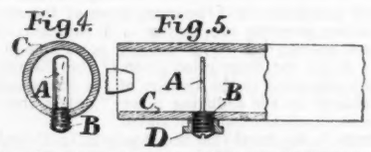


Fig. 4. Fig. 5.

Pember's Regulator for Atmospheric Burners.

presented more or less edgewise to the incoming air and gas in order to increase or decrease the quantity of air entering the mixing tube.

Fig. 1 is a longitudinal section through a mixing-tube fitted with such a baffle; fig. 2 a cross-section; and fig. 3 a horizontal section—

different positions of the baffle being indicated by dotted lines. Fig. 4 is a transverse section through the mixing tube, showing the baffle partly turned to allow a greater quantity of air to enter; while fig. 5 shows a slightly modified construction of baffle in which a lock-nut is provided for rigidly securing the latter in the desired position.

A is a flat metal tongue or baffle which is carried by and rigidly secured to an externally screwed taper plug B, adapted to engage with a tapped hole in the side of the mixing-tube C, so that the tongue extends across the tube. To restrict the amount of air entering the tube, the plug is rotated so that the side of the tongue is opposite to the open end of the mixing-tube as in figs. 1 and 2. When it is desired to allow more air to enter the mixing-tube, the plug is turned so that the tongue is presented more or less edgewise to the open end of the tube. Besides regulating the amount of air entering the mixing chamber, the tongue also serves to break-up the incoming gas and air and ensures a better mixture being obtained.

As shown in fig. 5, the screw plug may have parallel instead of tapered sides, and is fitted with a lock-nut so that the plug and tongue may be rigidly secured.

Atmospheric Gas-Burners.—No. 159,336.

VALENTINE, H. S., of Glasgow.

No. 30,022; Dec. 2, 1919.

This invention relates to burners wherein the combustible mixture of gas and air is caused to issue from a single elongated orifice or a plurality of orifices, and to produce, on ignition, a sheet, or sheets, of flame.

The invention consists in embodying, in such burners, pivotal members which are adapted to regulate the size of the orifices, or jets. Each operative face of such members may follow (in section) the contour of an arc of either an ellipse or of a circle of a diameter greater or less than the width of the pivotal member or maybe plane; and each constitutes one side of the wall of an orifice or jet. Regulation of the jets is effected by angular movement of the pivotal members.

Water-Gas Producers.—No. 159.409.

TULLY, C. B., of Victoria Street, Westminster.

No. 5099; Feb. 19, 1920.

The object of this invention is to provide simple means whereby the steam and gas valves of water-gas producers can be opened and closed at the required times "in an easy and definite manner." For this purpose, the rod (or equivalent) used for operating, from the exterior of the wash-box, a lever for moving the gas valve towards and from the submerged end of the gas-exit pipe within the wash-box, is interconnected with the steam-valve used for admitting steam to the gas-producer, and with hand-operated means, so that the gas and steam valves can be properly opened together or closed together.

The invention can advantageously be used in connection with a gas-producer having upper and lower gas-exit pipes through which the water gas, methane, hydrogen, carburetted hydrogen, or other gas generated in the producer, alternately flows, and in which the valves for controlling the exit of gas from the pipes are arranged within a wash-box forming, with the gas-exit ends of the pipes and the gas valves, a gas and liquid valve arrangement operating as described in patent No. 112,091.

The illustration is a front elevation of a gas-producer provided with the valve-controlling apparatus, and a part vertical section at right angles.

A is the producer having upper and lower gas-exit pipes B C connected to pipes extending through the removable cover of a wash-box D containing liquid E into which the lower ends of the pipes dip. F is one of the gas-exit valves adapted to open and close the lower end of the corresponding gas-exit pipe—the pipe being pivoted to, and carried by, a lever G. H is a rod connected to the valve lever G and extending through a stuffing box I to enable the valve to be operated from the exterior of the wash-box D. K is a main steam pipe with control valve from which steam can be admitted at will to the producer.

In the example shown, it is intended that steam shall be admitted to the lower part of the producer for the direct production of water gas during an up-run, and also that steam shall be introduced into the upper part of the producer during the down-run, in which gas coming from another producer is caused to flow downward through the producer and the incandescent fuel therein, for the purpose of decomposing some of the constituents of the gas and obtaining a permanent gas. Accordingly, the steam-pipe K is provided with two branch steam-pipes, M and N, leading to the lower and upper portions of the gas-producer and each provided with a controlling valve O.

For connecting each gas-valve F to its corresponding steam-valve O (so that they can be opened and closed together), the upper end of each rod H is connected by a link P to a lever arm R fixed to the spindle S of the corresponding steam-valve O; and to the connection between the rod H and link P is jointed one arm of a hand-lever T, the other arm of which is loaded by a weight W, to counterbalance the weight of the gas-valve and attached parts—the lever being pivoted at U to a bearing V carried by the cover of the wash-box D.

By this arrangement each of the connected pairs of gas and steam valves F and O can be opened simultaneously, and held open by raising the weighted arm of the lever T. Upon releasing the lever, the two valves will be closed simultaneously, and held in the closed position by the weighted arm of the lever until the arm is again raised.

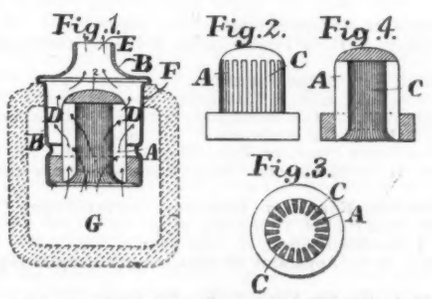
X is a pipe with a valve Y, whereby condensed steam can be drained from the steam-pipe K (at the delivery side of the valve) into the wash-box. The pipe X, together with a vertical rod Z, serve as a convenient means for supporting the steam-pipe K above the wash-box D.

Atmospheric Gas-Burners.—No. 159,594.

YATES, H. JAMES, HOWLETT & CO., LTD., and DOLPHIN, J., of Birmingham.

No. 29,777; Nov. 29, 1919.

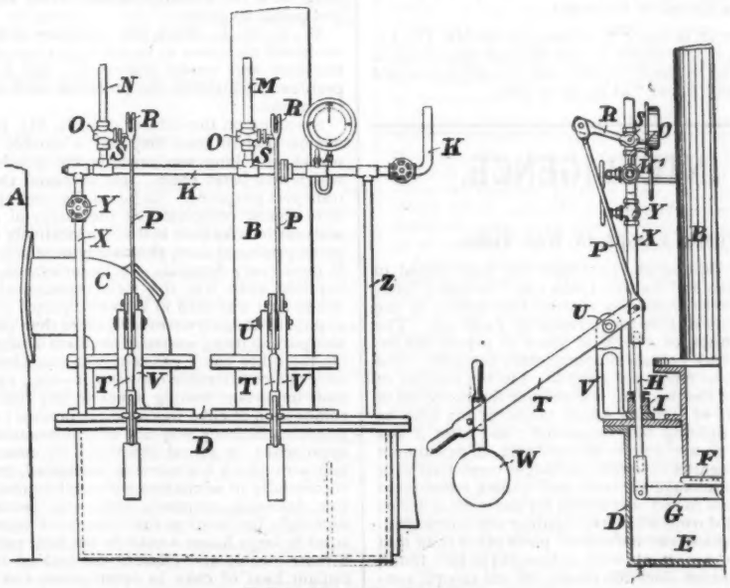
This invention refers to atmospheric gas-burners used for heating purposes—more particularly in gas-fires; the object being to provide a burner which, while "effectually preventing flame noises at the nozzle, will be so constructed and arranged that a certain accumulation of dust and dirt in the burner will not materially affect the flame and can very readily and quickly be removed from the burner."



Yates, Howlett, and Dolphin's Atmospheric Gas-Burner.

Fig. 1 is a sectional elevation of the burner—a portion of the casting being in dotted lines. Fig. 2 is a front elevation and fig. 3 a sectional plan of the refractory dividing and mixing member provided in the burner nozzle. Fig. 4 is a sectional elevation of it.

A is the refractory member which serves to divide and mix the gaseous mixture. It is of cylindrical form, open at the bottom and closed at the top. The upper part is of smaller diameter than its base.



Tully's Water-Gas Producers.

The member A is pierced with a number of narrow vertical slits C, which extend radially from the interior to the exterior, and also extend longitudinally from the top to the bottom through the base. The slits are preferably made with radial sides so that they are wider at the external periphery of the member than at the interior. The gaseous mixture expands, and its pressure is reduced as it thus passes along and through the slits. B is a thin metal cylindrical body-part in which the refractory dividing and mixing member A is enclosed. It is made of considerably larger diameter than the slit portion of A above its base, so that there is an annular space D all round communicating with the space above the top of the refractory member and also with the top outlet nozzle E. The body-part B fits as a nozzle in the usual way in the cylindrical hole F of the burner casting which as usual is formed with several holes side by side in a row communicating with the passage G through which the gaseous mixture flows to the various nozzles. It is thus broken up and formed into eddies "so that the usual flame noise at the outlet is prevented or reduced to a minimum."

Any dust entering the nozzle hole E falls on to the top of the refractory member and down into the bottom of the annular space D; and although such dirt may accumulate in the annular space some little distance up the slits and choke their lower portions, the passage of the gas is not materially affected, as it can still pass through the portions of the slits above the dust and dirt accumulation.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for March 31.]

Nos. 8634 to 9214.

Armitage, W.—"Cooking-stoves, &c." No. 8828.
Carpenter, C. — "Carriers for supporting incandescent gas-mantles." No. 8831.
Cutler, S.—"Gas-producers." No. 9210.
Davidson, T. M.—"Retorts for distillation of coal, &c." No. 8723.
Ferguson, A.—"Production of combustible gases and their utilization for heating." No. 9177.
Gibb, D. M.—"Gas-burners." No. 8879.
Harris, E.—"Taps for gas, &c., burners." No. 9153.
Hickinbottom, F.—See Gibb, D. M. No. 8879.
Highett, R. F.—See Ferguson, A. No. 9177.
Hildick, H.—"Gas-making apparatus." No. 8976.
Hird, H. P.—"Apparatus for carbonization of coal, shale, &c." No. 8636.
Holzwarth, H.—"Gas-turbines." No. 8677.
Illingworth, S. R.—"Production of smokeless fuels and coke." No. 9129.
Kling, F. E.—"Dry gas cleaners." No. 8700.
Meade, A.—See Cutler, S. No. 9210.
Mitchell, E. A.—"Gas-distributing systems." No. 9160.
Parker, T. H.—"Gas-producers." No. 8804.
Parkinson Stove Company, Ltd.—See Gibb, D. M. No. 8879.
Plauson, H.—"Manufacture of hydrocarbons from coal, &c." No. 9053.
Sudan Cotton, Fuel, and Industrial Development Company (1919), Ltd.—See Parker, T. H.—No. 8804.
Vielle, J. A.—See Plauson, H. No. 9053.
Watson, C. S.—"Apparatus for exhausting or compressing gases." No. 9061.
Weidlein, L. B.—See Kling, F. E. No. 8700.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF COMMONS.

German Chemical Factories.

Sir L. Worthington-Evans, in reply to a question by Mr. Doyle, said the introduction to the report of the British Mission appointed to visit enemy chemical factories in the occupied zone of Germany would be published as a "Command Paper" at an early date.

LEGAL INTELLIGENCE.

Payment for Public Lamps in War Time.

In the Court of Session, Edinburgh, judgment has been issued in an action in which the Largo and Lundin Links Gas Company, Ltd., Lower Largo, Fife, sued the St. Andrews District Committee of the County Council of the County of Fife for payment of £518 19s. The pursuers were under a contract for a term of years to supply the defenders with gas, and to render certain supplementary services. The rate of payment was fixed at so much per lamp lit; but the number of lamps was prescribed, and so the payment was not one which varied in accordance with the amount of lighting which might at any time be required. During the war lighting was suspended; and after it was over, the pursuers obtained, on application to the Court, an annulment of the contract as being, as regards its terms, no longer consonant with current prices, owing to the change in costs and values consequent upon the war. They had now raised this action for payment in terms of the contract for the period during which the lighting was suspended. The Judge (Lord Sands) repelled the defenders' pleas other than that to the effect that the pursuers' averments were unfounded in fact, found the pursuers entitled to expenses since the closing of the record, continued the case, and granted leave to reclaim.

MISCELLANEOUS NEWS.

"B.C.G.A." CONFERENCE AT TUNBRIDGE WELLS.

The members of the Southern District of the British Commercial Gas Association met in conference at Tunbridge Wells last Thursday. At the invitation of the Chairman and Directors of the Tunbridge Wells Gas Company, luncheon was first partaken of at the Spa Hotel, when Alderman W. H. Delves, J.P., the Chairman of the Company, presided, supported by the Mayor and other Corporation officials and leading residents.

The Mayor, in submitting the toast of "The Visitors," said he took it that the Association was formed in order to ascertain what was best, as the result of research and from a consultative point of view, in the interests, not only of gas companies but of the consumers. Speaking as one who was the Chairman of the local electricity undertaking for many years, he was bound to say that electricity for lighting could not be beaten, but for heating and cooking they had a long way to go to beat gas.

Mr. W. E. Price and Mrs. Cloudesley Brereton responded—the latter remarking that the Association stood for sunshine, science, and service. It stood for stopping smoking chimneys in the respectable homes of the people, and for helping research by subscription and in other ways.

The toast of "The Tunbridge Wells Gas Company" was proposed in felicitous terms by the Town Clerk (Mr. W. C. Cripps), who remarked that he had always taken particular interest and pride in the Company, because it always had been a Tunbridge Wells Company, run by Tunbridge Wells men mainly by Tunbridge Wells capital, and so far had always been run in the interests of Tunbridge Wells. He traced the growth of the Company, and referred to the great interest which the late Sir George Livesey had taken in the local Company. He believed Sir George was the main promoter of the sliding-scale and co-partnership as between gas companies and their employees. No reasonable person could do anything else than sympathize with the shareholders of gas companies in the unfortunate position in which they had been placed owing to the late war. People did not appreciate that were it not for the capital which in years gone by was invested by the public in various gas undertakings, the position of the country would have been very different from what it was now. After an allusion to the coal crisis, he (Mr. Cripps) eulogized the services rendered by the venerable Chairman of the local Company (Alderman Delves), who had reached the great age of 92, and had been Chairman of the Finance Committee of the Town Council since 1885. The Gas Company had good reason to be proud of him; and if there were men like him associated with the gas companies of the country, as he knew there were, these undertakings would go on and prosper.

Alderman Delves, in reply, said he had known the concern since 1843; and during the whole of that time the Company had studied the interests of the consumers as well as the shareholders. He hoped, now that the new legislation was in force, they would be able to put on a proper footing the sliding-scale, whereby the consumers became partners with the shareholders of the Company. In 1914, the wages and salaries were something like £1000; and last year they were £26,600. The result was that the shareholders' profits were reduced to less than one-third of the wages paid. He suggested that the reports of companies should show the small proportion which the shareholders and debenture holders received in comparison with that paid to labour.

At the conference which followed, the main subjects dealt with were housing, smoke abatement, and the calorific value regulation.

Mr. W. H. Becket, representing the Housing Committee of the Association, opened a discussion on the best methods by which the gas industry could help the Government to carry out the difficult housing schemes in the best interests of the public; and Mrs. Brereton dealt with the housing question from the point of view of personal and public hygiene.

Mr. E. W. L. Nicol, the Secretary of the London Coke Committee, explained his views as to the utilization of gas-coke in the interests of economy and smoke abatement; and Dr. Saleeby lectured on the problems of atmospheric pollution, and its effects upon the health of the nation.

Speaking on the subject of fuels, Mr. Nicol said it was his firm conviction that in coke they had a reliable and economical fuel, which would go a long way towards the solution of many of the problems which now beset them. He favoured the increased use of coke for transport purposes. So far as the cost of petrol was concerned, they were almost completely at the mercy of powerful foreign combines; whereas in coke they had a comparatively cheap and widely-distributed home-produced fuel, the supply of which should always be adequate to meet every demand. In factories, too, in which steam power was required, coke was the most economical fuel for generating steam. When coal was used in a boiler-furnace its volatile constituents (about 30 p.ct. by weight) were rarely more than partly burnt—quite a considerable portion being wasted in the form of deposited soot and unburnt gas. On the other hand, gas coke was smokeless and contained practically only one combustible constituent—viz., carbon—which was by far the most important heating agent in any fuel. Compared with coal, the combustion of coke was a simple process; and by its use the maximum possible efficiency was not only theoretically attainable but was often approached in actual practice. By means of the "Sandwich" system with which his name is associated, gas coke was now being fired successfully in admixture with coal on chain-grate mechanical stokers. For domestic purposes, coke was becoming increasingly popular, especially for heating the household water supply. In the medium-sized or large house a coke-boiler was undoubtedly the cheapest, and a most cleanly and efficient method of heating water. The intense radiant heat of coke in open grates and kitchen ranges—more than twice that of coal, weight for weight—was a great advantage. To

waste their precious supplies of crude coal in an unscientific manner by burning it in an open grate or a factory furnace was a suicidal policy. Their coal reserves were far too small to permit of waste.

An interesting paper on the "Therm" was read by Mr. Langford, the Engineer of the Tunbridge Wells Gas Company, showing that the new unit of charge adopted by Parliament for gas—viz., the "Therm"—had been fixed at 100,000 B.Th.U. Necessity was laid upon the gas industry to demonstrate clearly that the new basis of charge was designed to protect public interests, and to secure that the gas consumer obtained what he paid for. The charge, in a word, was that of substituting for quantity only, quantity *plus* stated and clearly defined and publicly controlled quality. A brief outline of the history of gas charges was given by Mr. Langford. It was pointed out by him that the original mechanical principles adopted in 1844 for the correct measurement of gas still persisted. Hundreds of inventors had endeavoured to get something better, but they had improved on details only. To-day the meter stood as the survival of the fittest. The root meaning of "Therm" was heat value; and to aid the popular mind, and perhaps touch the imagination a little bit, the new word might be treated as a single acrostic, as follows: T for test, H for heat, E for efficiency, R for romance, and M might fittingly be taken to stand for measure. The new unit of charge combined in one the two important factors of quantity and quality. It provided an up-to-date and scientific basis for the policy of a fair bargain between buyer and seller, with a strictly limited profit for the latter, which had long been followed up by gas companies. They might fairly claim that century-old gas (with new and up-to-date methods of measurement) still stood, in its power for service to the individual, the community, and the nation, for "good measure, heaped together, pressed down, and running over." Mr. Langford gave credit for the paper to Mr. W. M. Mason, the Manager of the Association.

Mrs. Brereton dealt with the conservation of energy as it affected the motherhood of the nation, remarking that household work was human work. They did not ask that it should be less human, but that it should be more humane. She urged that all houses should at least be fitted with gas-fires in bedrooms and parlours. The use of gas appliances would go far to solve the service problem. The authoress paid eloquent testimony to what she termed the vicarious and altruistic motherhood of our medical and teaching professions.

In the evening, at the Pump Room, Dr. C. W. Saleeby, F.R.S.E., lectured on "Coal Smoke and its Effect on Health and Wealth."

The chair was occupied by the Mayor, and Dr. F. C. Linton, the Medical Officer of Health for Tunbridge Wells, in proposing a vote of thanks to Dr. Saleeby, said it gave him special pleasure to meet him again after several years, as they were fellow students at Edinburgh University, and together they investigated specimens of lungs of new-born infants of Esquimeaux and of British miners and town dwellers—the latter damaged and impregnated by the effects of breathing coal smoke. Dr. Linton said it was news to him that the death-rate from tuberculosis had been halved in so short a time in American cities by forbidding the burning of soft coal; and certainly as one of the workers in the cause of preventive medicine this and other statistics brought forward by Dr. Saleeby in his able and interesting lecture (supported by such striking lantern slides) had made a great impression on him, as he was sure it must have done on all present. What had been done in America could be done in the "Old Country;" and though many might still feel a sentimental fondness for a coal-fire as more companionable than a gas-fire, it must be remembered that vast improvem ents had in recent years been made in the design of the latter; and that, if the burning of crude coal was responsible for the "diseases of darkness" described by Dr. Saleeby, no man who cared for the future of the human race could afford to plead sentiment as against science in the matter. He thought Dr. Saleeby was doing a very great public service in bringing these facts before the public. Obviously, there was a great deal of ignorance on the question; and more education was needed both in schools and among older people.

Mr. A. W. Brackett, J.P., a Past-President of the Auctioneers' Institute, and a Director of the Tunbridge Wells Gas Company, seconded briefly and formally.

Dr. Saleeby moved a vote of thanks to the Mayor for presiding. This vote was carried by acclamation; his Worship remarking that valuable instruction had been gained by the day's proceedings.

"B.C.G.A." CONFERENCE AT TORQUAY.

For the first time the South-Western Section of the British Commercial Gas Association held its annual conference at Torquay, on Monday last. Admirable and complete arrangements were made by the local Committee, of which Mr. A. Iredale (the Chairman of the Torquay Gas Company) is Chairman, and Mr. R. Beynon (the Engineer of the Torquay Gas Company) Secretary. Many of the sixty delegates arrived on the Saturday, and spent the week-end in Torquay. The proceedings were favoured with perfect weather. Previous to the luncheon and conference, the delegates were welcomed by Mr. Iredale and the other Directors of the Gas Company, following which a generous luncheon was served at the Bath Saloons, which are situate in the same building, overlooking the sea, in which are Torquay's famous medical baths.

The delegates were welcomed at the Swiss Café by Mr. Iredale, after which luncheon was served—Mr. Iredale presiding, with Major R. P. Kitson, Mr. Dundee Hooper, and Mr. J. F. Rockhey (Directors of the Torquay Gas Company) as Vice-Chairmen.

The Loyal toasts were given from the chair, and heartily honoured.

The Mayor of Torquay (Mr. H. Williams), in proposing "The Visitors," said those present represented a very important and indispensable industry; and he regarded it as a feather in the civic cap that they had chosen Torquay for holding their conference. There was no place in England where business and pleasure could be more profitably and pleasantly combined than in Torquay, and in no other town in England where they would receive a more hearty welcome. He congratulated the gas industry on the great ability shown in the way of advertising itself. The Torquay Gas Company had not overlooked the fact that an attractive display in its windows was one of the best forms of advertising.

Mr. F. W. Goodenough, the Executive Chairman of the "B.C.G.A.," in reply, said he regarded Torquay as his spiritual home, because he had been instructed there for some years under his old friend the late Mr. T. Viccars, who then conducted a college in the town, and to whom he owed much for what he was to-day. Their great aim, as an industry, was to be of real service to the community; and it was because Torquay was so well served in all branches of the public services that it was a real pleasure to visit the town. If their fellow citizens throughout the country would only burn coal in the right way, sending it first to the gas-works to be properly treated, they could enjoy, even in the great industrial centres, something of the same climate as was enjoyed in Torquay.

Mr. J. W. Whimster (Bath), the President of the Southern District Association of Gas Engineers and Managers, gave "The Torquay Gas Company," remarking that they had seen the "Queen of the West" under ideal weather conditions which justified its title.

The Chairman, in responding, said the only industry of Torquay was the manufacture, restoration, and building-up of health. Fifty or sixty years ago gas was almost exclusively an illuminant; but science had come along and widened and broadened its uses. Science had not finished yet, and he believed there was a great future for the gas industry of the country.

Mr. F. W. Goodenough took the chair at the conference which followed; the main subjects down for discussion being smoke abatement, housing, the therm basis of charge for gas, and coke as fuel.

Mr. Goodenough, dealing with the aims and objects of the Association, said that it was a commonsense business proposal on the part of any undertaking to do its utmost to serve its customers. They were none of them philanthropists—the labourer was worthy of his hire. All they asked for was a square deal. They wished to give good value for money. What did the Association do, and how could it serve the industry and the community? If they served the community aright they were serving the gas industry right. Some people regarded the Association merely as an advertising body. Well, advertising had been described as telling the truth attractively; and they wanted to live-up to the description. The truer every statement made to the public in every advertisement issued, the more value would be got from the advertisement. The Association was doing everything it possibly could to arrive at the truth in regard to the applications of gas. It financed research at University College, London, where very valuable work was being done by Prof. Barker in investigations into heating, the use of fuel generally, and cooking and ventilation. And, in the pursuit of truth, another great advantage of a co-operative Association like theirs was that they were able to pool the knowledge of all the gas undertakings up and down the country, and give the advantage of it to consumers and gas companies alike. A further effort of the Association was to raise the standard of service throughout the industry; and this was badly needed in a good many quarters. He meant this remark to apply to all, from the highest to the lowest, to the most progressive as well as to the least progressive. He looked forward to the Association being of great value to the industry in raising the standard of efficiency generally. They could do this by meeting together frequently, talking over their problems, and pooling their experience.

Mr. E. W. L. Nicol, of the London Coke Committee, followed with an address in which he gave his views on the subjects of fuel and the development of coke sales. In regard to transportation costs, petrol, he said, at its present abnormally high price, made transport of merchandize by road little less than a luxury. Yet road transport was a development of our industrial life which everyone agreed should be encouraged. With petrol at 2s. 8d. a gallon, and coke at 40s. a ton, the comparative haulage done per pennyworth of fuel used in a standard 4-ton lorry worked out at 1·58 and 4·50 ton-miles respectively. Coke was the most economical fuel for developing steam. Referring to the "Sandwich" system, in which gas coke was now being fired successfully in admixture with coal on chain-grate mechanical stokers, he said the London County Council had reported most satisfactorily on the system as applied at the Tramway Power Station, at Greenwich, and stated that, owing to the increased use of coke and coke breeze, a saving of about £8000 a year could be effected; while low-grade classes of coal could be dealt with at a much higher efficiency than would be the case if burned separately. He next referred to the increasing popularity of coke for domestic purposes. From the national point of view, too, there was everything in favour of the use of coke wherever solid fuel was required. There were large stocks of coke in all the big centres; and, consequently, they would be of immense value if the miners' strike continued.

Another subject dealt with had reference to the latest aspect of the housing schemes. The points placed before the delegates emanated from the Executive. Owing to the heavy increases in the cost of labour and material, it was quite impossible for the gas industry to attempt to give free services as regards gas mains, pipes, and apparatus, as was the practice in pre-war days. Unless the housing authorities would encourage a greater use of gaseous fuel in the new houses, the business, from the gas industry's point of view, was not worth considering. The Executive wished to emphasize that a great waste of public money incurred in laying gas-mains and electric cables to the new houses when there was not enough load to make both profitable. They recommended the adoption of gas for heating and cooking; thus making the installation of economy gas-fire flues possible, which would mean the saving of £30 per house. By this means a real advance would be made in national economy, the smoke problem, a reduction of labour in the home, and the conservation of the national coal resources.

Mr. W. H. Becket, as representing the Housing Committee of the Association, opened a discussion on the best methods by which the gas industry, as an organized industry, could help the Government to

carry out the different housing schemes in the best interests of the public.

Mr. R. Beynon read an interesting paper in which he indicated the reasons which led the Government to adopt the new therm basis of charge for gas, and some of the advantages which would result. It had long been patent to all gas engineers that to have to work to an illuminating standard in the days when more than nine-tenths of the gas sold was burned in atmospheric burners was absolute folly, especially as enriching materials became scarcer, and the ordinary run of coal became poorer. It needed a war to bring these facts home to our legislators; for it was not till the scarcity of oil supplies, and the poorness of the quality of the general run of coal sent to gas-works, that Parliament awoke to the need, and caused inquiry to be made. The advantages to be obtained by the consumers were manifest, as in the future they would buy heat units, which were unalterable things. The Board of Trade had laid down stringent conditions as to testing the gas; and if the local authority failed to appoint an inspector to verify the quality, the County Council would do so. These inspectors were to be paid from a central fund created by the gas companies; so that it might be said that the gas consumer came out with the best of the bargain in all respects.

Hearty votes of thanks concluded the conference, after which the delegates were entertained to tea. In the evening, Major R. P. Kitson presided at the Museum Hall, where Dr. C. W. Saleeby, F.R.S., Edin., gave his popular lecture on "Smoke Abatement and the Conservation of Life."

AUSTRALIAN GAS LIGHT COMPANY.

A Special General Meeting of the Company (being an adjournment of the last annual meeting) was held at the Royal Exchange, Sydney, on Feb. 14—Mr. George J. Cohen (the Chairman) presiding.

The Secretary (Mr. C. U. B. Garnett, A.C.I.S.) having read the notice convening the meeting, the report and balance-sheet were presented.

The Chairman, in moving the adoption of the report, said he was pleased to be able to tell the shareholders that the consumption of gas continued to increase, being 13·7 p.ct. over the quantity used during the corresponding period of the previous year. The gas sold for the half year amounted to 2,698,573,000 c.ft. The gas consumers now numbered 159,559—an increase during the six months of 5065. The number of cookers sold to date was 53,012, showing an increase for the half year of 1009. Unfortunately, this department of the Company's operations had been considerably hampered during the period under review, in consequence of industrial troubles, shortage of materials, &c., preventing adequate supplies. There were, however, already indications of an early return to more normal conditions. The public lights in use to date numbered 8521; the increase for the half year amounting to 79. In view of the Proclamation issued by the Necessary Commodities Control Commission, no increase in the charge for this service could be made without first obtaining the consent of the Commission. Application was, therefore, made for permission to increase these charges; and this was granted on Oct. 27 last. The total mileage of mains and services laid to date was 3634; the extensions for the past half year being 37 miles. It was found necessary, owing to the increased cost of coal, oil, labour, and additional taxation, to apply to the Government for permission to increase the price of gas. This application was lodged with the Minister on July 16 last; but the inquiry was not held until October. Mr. Justice Wade, the Commissioner, recommended that the standard price be increased to 5s. 9d. per 1000 c.ft.; and a Proclamation to this effect duly appeared in the "Government Gazette"—the new price coming into operation on Nov. 24. The "flat rate" (which was installed owing to the shortage of meters) has now been abolished; the necessary meters being available. Under the Local Government Act, 1919, the question of the annual charge to be made in connection with assessment of mains in the various municipalities and shires was vague and indefinite. The clause particularly relating to this charge stated that the Council might make a fair annual charge, based upon the nature and extent of the benefits enjoyed by the person concerned. As a result, certain anomalies had arisen. In order to avoid litigation, the Board had approached the various councils, with a view to the appointment of independent arbitrators to lay-down a definite basis on which these charges should be made, and for a definite period. The stock of coal showed a very slight gain. In view of all the difficulties which had been encountered, a large augmentation of supplies was not possible. It was anticipated, however, that this condition would improve considerably during the current half year. The programme of extensions to works was well in hand, though, in common with other industries, the Company had suffered considerably from delays in obtaining materials. He was, however, glad to report that, almost without any exception, the whole of the materials had been, or were being, produced in Australia, and that, so far as the gas industry was concerned, Australia might be said to be almost self-supporting. He hoped, by the time they next met, to be in a position to report that one-half of the older carbonizing plant at the Mortlake works had been reconstructed on modern lines, and that the plant for the receipt of coal had been more than doubled in capacity. In view of the increase in the Company's business, it had been found necessary further to extend the works; and the task of constructing a fifth retort-house, on the most modern lines, with its attendant plant, was now in progress, though the time required for its completion would be at least two years. Owing to the magnitude of the reconstruction work at Mortlake, it had been found necessary to keep the Kent Street works in commission; but as soon as the reconstructed plant at Mortlake was again put into operation, the use of these works would be dispensed with.

The report was adopted; and a vote of thanks was passed to the Directors and officers for their efficient management of the Company's business during the past half year.

This concluded the proceedings.

DEVON GAS ASSOCIATION, LTD.

The Fifteenth Annual Meeting of the Devon Gas Association was held last Thursday at Exeter. There were present Mr. F. T. Depree (Chairman), Messrs. S. Simpson, R. J. Rew, G. Lane (Secretary), F. Blanchford, T. Glanfield, H. C. Rowe, T. Willey, W. J. Jackson, F. J. Webber, Mrs. H. A. Willey, Mrs. D. K. Longridge, and Mr. F. B. Dupree.

The Chairman, in reviewing the balance-sheet for 1920, called attention to the large increases which continue to appear on both the expenditure and revenue sides. The repairs of works necessarily postponed during the war period had been heavy during the year; but the trade conditions of the past year had satisfactorily met this somewhat abnormal expense. The receipts generally must be regarded as satisfactory. The profits on fittings and all residuals showed very considerable increases, and went to make up a satisfactory year's trading. He referred to the fact that in spite of the restricted trade outlook generally, their business continued to increase; the use of gas having become so great a necessity of everday life—even in the small towns. There was no reason to suppose that any reduction in the output of gas was likely to occur. A developing business needed additional capital, which, in common with all gas companies, they had some difficulty in raising; but steps were being taken to provide the necessary funds.

Mr. R. J. Rew remarked that an examination of the trade accounts of the Association would best reflect its prosperity. There had been many times of difficulty in the past, when even a modest dividend was difficult to earn. Those days happily appeared to be past, and the Association was now in such a position that he looked forward with equanimity to the future. The immediate future, however, was not without some difficulties. The market for all gas residuals had slumped badly; but he anticipated sufficient margin to maintain, if not improve, the present satisfactory trading of the concern.

The report was adopted, and a 6 p.ct. dividend, less income-tax, was declared.

WREXHAM GAS COMPANY.

At the Ordinary General Meeting of the Company last Wednesday, Mr. J. Oswell Bury, in the chair, moved the adoption of a satisfactory report.

An expenditure of £2500 on a water-gas plant and additional boiler power had brought the debit balance of the capital account to £15,153; and an extraordinary meeting would at an early date be convened to authorize the issue of additional capital.

The net increased receipts amounted to £13,241, and the net increased expenditure to £7988. The sales of gas had increased by £7792 mainly owing to the increased charge, but also to the additional sale of over 9 million c.ft. of gas. The total amount received for gas was £36,571—viz., £19,301 from ordinary consumers and for public lighting, and £17,270 from prepayment meters. Residual products realized the large sum of £18,497—an increase of £5368, due to the greatly increased value of tar during the year, and also to the price obtained for coke.

The receipts from meter and cooker rents, fittings, &c., amounted to £1049—an increase of £81. The total receipts for the year were £56,117, as compared with £42,876 in 1919. The total expenditure out of revenue was £46,608, as against £38,619 in the previous year. The balance of revenue account carried to the profit and loss account for the past year was £9509, making, with the net balance brought forward from the previous year £981 and accrued interest £164, a total of £10,655. Out of this total, the interest on mortgages and bank interest up to Dec. 31 last, together with the half-year's dividend to June 30 last had already been paid, amounting to £3769. This left a balance of £5866, out of which the Directors recommended the payment of a dividend for the half year at the rate of 3¾ p.ct., amounting to £1996 13s. 9d.

It was reported that the Company's application to the Board of Trade in connection with the passing of the Gas Regulation Act, 1920, had been successful. Maximum prices of 1s. 7d., 1s. 8¼d., and 1s. 9⅜d. per therm were asked for (equal approximately to 7s. 1½d., 7s. 7d., and 8s. 1d. per 1000 c.ft.); and the maximum prices under the Order were equal to 6s. 8d., 7s. 1½d., and 7s. 8d. per 1000 c.ft., which still allowed a margin for any future increase.

The report was duly seconded and unanimously adopted, as was a motion for the re-election of the retiring Directors and the increase of the Directors' remuneration to £500.

Leamington Priors Gas Company.

The Company's ordinary general meeting yesterday week was presided over by Dr. Thursfield, J.P. The finances of the Company, he remarked, were in no better position than during the war; but fortunately, though trade generally was bad, gas was now looked upon as practically a necessity. The carry-forward had dropped nearly £2700 in eighteen months. For the past half year coal and gas-oil had cost £32,000, and wages had amounted to £14,000, as against £10,000 and £4000 respectively in the corresponding period of 1913. There was a certain downward trend in prices to-day; and when the employees could be shown a prospect of cheaper living, the question of reducing wages would have to be faced. Sulphate of ammonia was finding a ready sale; but the restrictions on coke export they had suffered were only removed when the f.o.b. price had fallen to 30s. from £12 a ton. Their remarkably low price of 4s. per 1000 c.ft. might have to be increased, as they were far from making the supposed large profits from residuals. The motion for the adoption of the report and accounts was seconded and passed.

ALLIANCE AND DUBLIN CONSUMERS' GAS COMPANY.

Half-Yearly Meeting.

The Half-Yearly General Meeting of the Alliance and Dublin Consumers' Gas Company was held at the Offices, D'Olier Street, Dublin, on Thursday last—Mr. John Murphy (the Chairman) presiding.

The Chairman's Address.

The Chairman, moving the adoption of the report [see "Journal," March 23, p. 762] and statement of accounts for the half year ended Dec. 31 last, said that, while the figures were not so favourable as those submitted on the last two occasions, yet, in view of the continued high prices of materials and wages and the disturbed state of the City of Dublin, he thought they could not be regarded as unsatisfactory. The capital expenditure on this occasion was the largest incurred for several half years, although the usual items—mains and services, meters, stoves, and fittings—were normal. Under the heading of new land and buildings, however, the sum of just over £8000 had been expended in the acquisition of property where fixity of tenure was essential. The Directors had, therefore, purchased during the half year premises and land on Sir John Rogerson's Quay, adjacent to their works, having a frontage on the river of 152 ft., and running back a distance of 380 ft.; also a residence for their Engineer. In addition, they had secured the interest in the lease of the premises utilized for their show-rooms at Kingstown.

Revenue Account.

On the revenue account it would be seen that practically every item of expenditure had increased. The profit and sales of gas were down, although receipts from each source were higher—due, for the most part, to increased prices. In the gross cost of coal and oil there was little change in comparison with a year ago; but, after crediting the receipts from residuals, they were slightly over £18,000 to the good, which was a very satisfactory result, and again demonstrated the very efficient manner in which their products have been disposed of. Unfortunately, however, since the close of the half year markets had become depressed; and he feared that the high-water mark had been reached, and that subsequent results would not by any means compare so favourably. The only other item relating to manufacture of gas which called for explanation was the repair and maintenance of works—an abnormal increase under this head of no less than £56,259.

Renewals and Distribution.

Contracts were now proceeding for renewals of carbonizing plant, purifying plant, condensing plant, tar-extracting and scrubbing plant, central heating plant, and sulphate of ammonia plant. The appropriate proportion of each of these contracts had been charged against the accounts for the half year under review, and amounted in total to slightly over £57,000. Distribution had cost more by some £15,000. This was almost entirely caused by the larger expenditure on repairing and renewing their mains. Rent, rates, and taxes were up by over £2000. Management was also higher by practically a corresponding sum; but there was nothing abnormal calling for special comment. War wages showed an increase over the corresponding period of no less than £23,789. The amount now paid represented more than 1s. 6d. per 1000 c.ft. in the price of gas to consumers. Therefore it was evident that, if gas was to be supplied at a cheaper price a reduction in these war wages must take place.

Income, Dividends, &c.

With regard to income, the net receipts for gas were higher by £76,394. This was almost entirely due to the increased price, as, while the gas sold to prepayment consumers was 4 million cubic feet higher than during the corresponding period, and public lighting remained stationary, the sales to ordinary consumers were less by 14 million. In total, therefore, there was a reduction of 10 millions; and in view of the adverse circumstances, they could not expect more favourable results. In order to illustrate the serious effect to the Company's business caused by the Curfew Regulations, it might interest shareholders to know that up to the end of September there was an increase in the gas issued from their works of 14 million cubic feet, while from that date to the end of the year, this gain was converted into a loss in output on the half year of no less than 7 millions. The rental figures showed satisfactory increases under each head, and demonstrated the advantages accruing from hiring additional gas apparatus to consumers. After providing for the net revenue charges, the dividend recommended, of £3 6s. 3d. p.ct., could not be met without drawing from the carry-forward of last half year to the extent of £13,451. In other words, the net profit earned this half year was only slightly more than half the amount required for payment of the dividend. This clearly showed that gas could not be sold at its present price unless the existing output was increased, and the sudden fall in the price of residuals met by a corresponding decrease in the cost of essential supplies. On examining the balance-sheet, it would be seen that funds were down to the extent of £4000—again due to depreciation in investments. The amount due to sundry creditors, added to the overdrafts at the bankers, now reached the formidable sum of £224,000, which was in excess of the corresponding date last year by £73,000. This might at first sight appear unsatisfactory, unless it were appreciated that their stocks and debtors on the other side of the account substantially exceeded this large indebtedness.

Financial Revision Order.

Having disposed of the accounts, he came to the all-important matter of the Order which they were seeking from the Board of Trade for financial revision. This application for an amended standard price per therm had been made. It was probable, however, that some time would elapse before the Board of Trade could reach their case, owing to the large number of applications for similar Orders awaiting investigation. It was felt, however, that this would, on the whole, be advan-

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tageous, as by such time it was not unlikely that the future would be less obscure, and any adverse circumstances arising in the interval would doubtless be taken into consideration. So far, one Order only had been granted; but it happened to relate to the largest gas company in the kingdom—the Gas Light and Coke Company—and was, therefore, perhaps some indication of what other undertakings were likely to obtain so far as financial relief was concerned. It would be of interest to the stockholders to learn that amendments of importance to the gas industry as a whole, but in particular to their own undertaking, were put forward by the Directors and officials for insertion in the Bill; and he was glad to say that most of these amendments were eventually embodied in the Gas Regulation Act.

Mr. F. J. Dickens, in seconding the motion, said one of the shareholders had asked him the amount paid by the Company for war bonuses and allowances to dependants. The total (as shown in the accounts) was £57,745. This sum was the increase that had been paid to their workers in the shape of war bonuses, with the exception of the first advance given. The allowance to dependants was only a slight percentage of the whole amount. Another query was in reference to the large percentage of unaccounted-for gas. The Directors had spared no effort in the past in dealing with this matter. In 1913 the quantity was over 20 p.ct.; so that during the past few years the trend had been in the right direction. They hoped to reduce the quantity still further. One shareholder had written asking when it was likely the shareholders would receive a larger dividend. The Secretary had given him to understand that the earliest possible moment when they could expect to receive a larger dividend—assuming that they got their Order from the Board of Trade—would be this time twelvemonths. He (Mr. Dickens) would not like to fix a date for it; but he believed the Company had passed through the worst. When he looked back over the seven years that had elapsed since he joined the Board, and recalled all that they had gone through, he thought the meeting would agree with him in saying that they had had a very trying time. And now there was the unsettled state of the country, which was a serious menace to everyone—affecting all industrial undertakings, not only in Dublin, but elsewhere. There was further the Curfew Regulation, which brought in its train very serious restrictions of public lighting in such places as theatres, cinemas, and public houses. Social entertainments were restricted, and people had to retire to their homes at 8 o'clock in the evening. All these things had an adverse effect on the consumption of gas. Materials and wages had probably seen their highest point; and he believed that, with a general fall in the prices of materials and the cost of working, in the near future, they would be in a position to pay a higher dividend than that paid at present.

The motion was then passed; and a dividend of £3 6s. 3d. per cent. per annum, less income-tax, on the consolidated ordinary stock of the Company was declared, payable on April 9.

The proceedings closed with votes of thanks to the Board and officers of the Company.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" of applications by gas undertakings to the Board of Trade for Orders under the Gas Regulation Act.

Alliance and Dublin Consumers' Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 3s. 7d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute is 1s. 10·2d. per therm.

The following differential prices are now authorized under section 16 (2) of the Alliance and Dublin Gas Act, 1909:

Not more than 3d. per 1000 c.ft. (in excess of the price ruling in the City of Dublin, the Urban Districts of Rathmines and Rathgar, Pembroke, Blackrock and Kingstown, and the District Electoral Division of Donnybrook) may be charged within the urban districts of Dalkey, Killiney, and Ballybrack, and the town end of Terenure, for which it is proposed to substitute 0·66d. per therm; not more than 6d. per 1000 c.ft. (in excess of the price ruling in the City of Dublin and other districts as specified) may be charged within the remainder of the County of Dublin, for which it is proposed to substitute 1·33d. per therm; and not more than 1s. 2d. per 1000 c.ft. (in excess of the price ruling in the City of Dublin and other districts as specified) may be charged within the County of Wicklow, for which it is proposed to substitute 3·11d. per therm.

Blyth Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 4s. per 1000 c.ft. within the urban district of Blyth, and beyond the urban district increased charges of 6d., 1s., and 1s. 9d. per 1000 c.ft. respectively may be made; and the prices which they have asked the Board of Trade to substitute for these prices are 1s 8d. per therm as the standard price, and additional charges may be authorized for the area beyond the boundaries of the urban district of 1·2d., 2·4d., and 4·2d. per therm.

Bridgwater Gas Light Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 3s. 6d. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 1s. 7d. per therm.

Leyland Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 3s. 10d. per 1000 c.ft.; and the price which they have asked the Board of Trade to substitute for this price is 1s. 7½d. per therm.

Redcar Urban District Council.

The maximum price now authorized in respect of the supply of gas by the undertakers is 5s. per 1000 c.ft.; and the price which they

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have asked the Board of Trade to substitute for this price is 1s. 6d. per therm.

South Oxfordshire Water and Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers is 5s. per 1000 c.ft.; and the price they have asked the Board of Trade to substitute for this is 25d. per therm.

South Shields Gas Company.

The standard price now authorized in respect of the supply of gas by the undertakers in the County Borough of South Shields, the Borough of Jarrow, and the urban district of Hebburn is 3s. per 1000 c.ft., and an additional 4d. per 1000 c.ft. is also authorized for gas supplied in the rural district of South Shields; and the prices they have asked the Board of Trade to substitute for these prices are 1s. 5·4d. per therm, and an additional 0·8d. per therm respectively.

DECLARATIONS OF CALORIFIC POWER.

Having obtained their Charges Orders, the following Companies have intimated the calorific power gas they intend to supply:

Aldershot Gas, Water, and District Lighting Company.—450 B.Th.U. (April 1); and after July 1, 500 B.Th.U.
Bedford Gas Company.—450 B.Th.U. (July 1).
Brentford Gas Company.—460 B.Th.U. (April 1).
Croydon Gas Company.—470 B.Th.U. (April 1).
Preston Gas Company.—480 B.Th.U. (April 1).
Sheffield Gas Company.—480 B.Th.U. (March 25).
Southampton Gas Company.—460 B.Th.U. (April 1).
St. Albans Gas Company.—450 B.Th.U. (April 1).
Waterford Gas and Coke Company.—475 B.Th.U. (April 1).
Westgate and Birchington Gas Company.—460 B.Th.U. (April 1).

SPECIAL ORDER.

Tunbridge Wells Gas Company.

Application is to be made by the Company to the Board of Trade for a Special Order under section 10 of the Act, to extend the limits of supply, to provide for the transfer to the Company of the gas undertaking of the Southborough Urban District Council, for dealing with gas in bulk, &c.

Lewes Gas Company.—Under their Temporary Increase of Charges Order, the Company are paying dividends at the rates of 3¾ p.ct. on the original capital stock and 2¾ p.ct. on the additional capital stock. For this purpose the sum of £557 is taken from the reserve fund. At the meeting, the Chairman (Mr. John Miles) said the figures for the half year under review were much more satisfactory than those for the previous half year, when they could not pay a dividend at all.

STRIKE OF SOUTHEND GAS WORKERS.

Southend and Westcliff have been suffering the inconvenience of being without a gas supply. So far as can be gathered from the various reports that have reached us, it appears that about 250 of the employees of the Gas Company ceased work suddenly, and the town (other than the part supplied from the Corporation works at Leigh) experienced the cessation of its supply on Saturday. Southend being one of the popular seaside resorts of Londoners at the week-end, a great deal of difficulty was occasioned in regard to cooking and lighting. The cause of the trouble seems to be that the Directors of the Company apparently feel they are under no obligation to comply with the wages awards which are recognized by federated gas undertakings. According to the reports, the men some time ago asked that the question of the application of wages awards should be submitted to arbitration; but the Directors declined, though willing to fix a basic rate of wages on the cost-of-living scale. It was only on Friday that the men informed the Directors that, unless arbitration was agreed to, the men would come out on strike. Mr. Will Thorne, M.P., was at Southend last week endeavouring to bring about a settlement; but the strike shows that he was unsuccessful. A representative of the Ministry of Labour was expected to visit the town on Monday to inquire into the matter; but at the time of going to press, the information is that the strike has not been settled.

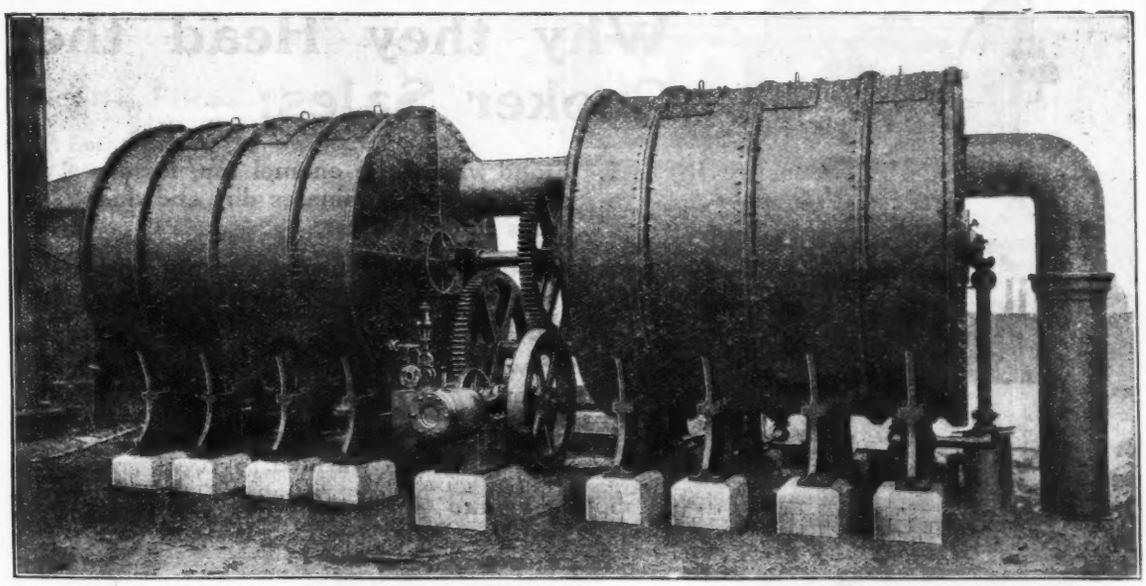
A circular issued by the Company puts another complexion on the point at issue. From the circular, it appears that the men have had all the national awards to which they are entitled, including the 30s. per man last Christmas, when a strike was averted. It was pointed out that, if the men's demands were met, it would mean an additional cost to the Company of £10,000 annually. The monthly wages bill in January, 1914, was £1560; in January this year, it amounted to £3670. The Company could only meet the men's demands by increasing the present high selling price of gas.

REPORT ON PIPES AND CASTINGS.

Adopted by the Standing Committee on Trusts.

A report (under the Profiteering Acts, 1919 and 1920) on Pipes and Castings, prepared by a Sub-Committee appointed by the Standing Committee on Trusts, and adopted by the Standing Committee, was issued last week. The Sub-Committee consisted of seven members, with Mr. M. V. Leveaux as Chairman; the terms of reference to them being "to inquire into the alleged trade combination of manufacturers of pipes and castings other than light castings, and the cost of contributory materials for the production of the same, and the effect of the combination, if found to exist, upon supplies and prices." The inquiry originated from a question in the House of Commons by Mr. Alfred

ROTARY SCRUBBER WASHERS



MADE TO SUIT ALL REQUIREMENTS. LATEST IMPROVEMENTS.

R. & J. DEMPSTER, LTD., MANCHESTER.

LONDON OFFICE: 34, VICTORIA STREET, WESTMINSTER, S.W. 1.

Short, asking the President of the Board of Trade whether he was aware that the London County Council had recently called for tenders for the pipes and castings used in connection with the erection of the North Woolwich Pumping Station; whether tenders were submitted by firms in Nottingham, Dudley, Chesterfield, and Middlesbrough; whether in all cases the tenders were for the same amount—namely, £27,072 10s. 0d. ordinary section, and £29,152 10s. 0d. special section; whether a ring existed among these firms; and, if so, what action (if any) he proposed to take. The following are extracts from the report.

Manufacturers Admit there is a Combination in Existence.

Representative manufacturers were examined; and they frankly admitted that they were members of an Association which fixes minimum prices. We are informed that there is a Cast-Iron Pipe Association, which includes in its membership practically all makers of cast-iron pipes cast vertically in dry sand. This Association was constituted in July, 1908, with the following objects:

(*a*) To obtain fair remuneration for its members.
(*b*) To consult together in order to obtain an adequate share of the export trade in face of foreign competition.
(*c*) To protect its home markets against foreign competition by combined action, so that the British foundries might be kept as far as possible in full operation, and give employment to a maximum number of workmen.

To meet foreign competition, a system was in operation whereby prices were averaged over all the makers, so that the unremunerative prices obtained were borne by the whole trade, and did not fall on the exporting maker alone. The Association appointed agents in various parts of the world for the purpose of promoting foreign trade for the benefit of British founders, who were thus able to keep their works supplied with a fair share of the export trade. With regard to the home trade, it was the general policy of the Association at that time to dictate which member's turn it was to take an order; and he was instructed to quote the lowest price, while the others were instructed to quote something higher.

Since the end of 1919 the constitution of the Association has been somewhat changed. A temporary arrangement continuing from month to month has been adopted of fixing minimum prices for cast-iron pipes, and a contribution of a payment of 2s. per ton by members on all deliveries, to meet expenses. We understand, however, that the contribution has now been reduced to 3d. per ton. There are no printed rules. The Association has no arrangement with other organizations, either at home or abroad. Its Committee meets from time to time, and fixes reasonable prices based upon the price of raw materials. If there was an increase in the price of coal or pig iron, the price of the pipes would be increased; and, conversely, if there was a reduction in the price of raw materials, the price of pipes would be reduced. It was asserted that during the period when the demand was greater than the supply, the Association had, in fact, been instrumental in keeping the price materially lower than it otherwise would have been had the Association not been in existence. We think, however, that attention should be drawn to the fact that the practice of the Cast-Iron Pipe Association in fixing minimum prices for all its members eliminates the principle of tendering with a view to securing materials at the lowest possible price.

It is a matter of conjecture what effect the Association would have upon prices when the supply becomes greater than the demand. It can quite readily be seen that an Association which has been in the habit of dictating fixed minimum prices at a time when the demand exceeds the supply, would be in a position to maintain prices when the supply is in excess of the demand. It has been suggested to us, however, that the competition of foreign pipe founders and the increasing competition of steel tubes and concrete pipes would effectually prevent the members of the Association from quoting excessive prices, even if they had any desire to do so.

With regard to foreign competition, we were informed that an increasing quantity of cast-iron pipes is now being received in this country from France, Belgium, Germany, and America, and we understand that the quality of these pipes is generally very fairly good. These foreign pipes are being sold in this country at a price 25 to 30 p.ct. below that of English pipes. We understand that orders are being placed with these foreign firms on an increasing scale, owing to the fact that the pipes can be delivered within about five weeks, whereas if the orders are placed with home manufacturers there is often a delay of twenty-six weeks.

Variation in the Price of Cast-Iron Pipes.

To take but a single instance as inkicating the successive increase in the price of cast-iron pipes, the following were the ruling prices paid by one large public body for 4-in. cast-iron pipes:

	Per Ton.
1906	£4 14 8
1914	7 0 0
1917 (January)	8 13 4
1917 (April)	9 12 0
1818 (April)	14 1 0
1919 (July)	17 1 0
1920 (April)	18 9 6
1920 (July)	21 12 0
1920 (December)	23 4 6

It is claimed by the manufacturers that the increase in the price was due to the increase in the cost of raw materials and in wages.

Chief Accountant's Report.

At our request, an investigation has been made by the Chief Accountant's Department into the costs and profits arising from the manufacture and sale of cast-iron pipes and heavy castings. A summary of the report submitted by the Chief Accountant accompanies the Committee's report.

Suggested Safeguards for the Ratepayers' Interests.

We have given consideration to the question whether it would not be advisable, as a safeguard to the ratepayer, that municipal authori-

The New "Bungalow" Cookers.

No. 2.

Why they Head the Cooker Sales:—

1. Stand with white enamel top, lessens stooping and eliminates dirt and dust traps under cooker.
2. Oven enamelled inside and out with rounded corners inside for easy cleaning.
3. Crown plate and wall plate of white enamel.
4. Patent Plate Rack holds plates upright so that all are warmed.
5. New and highly efficient hotplate burners fitted with gas and air adjusters.

In its five sizes the Bungalow provides a complete series for families of from 3 to 18 persons.

The Richmond Gas Stove & Meter Co., Ltd.,
WARRINGTON & LONDON.

ties should have power to instruct a fully-qualified Accountant to examine the costs of production when tenders are being submitted. Hitherto it has been the business of the Chief Engineer to advise as to the acceptance or rejection of tenders submitted; but we have not been able to discover that any steps have been taken—or, indeed, could be taken—to ascertain whether the prices quoted allowed only a reasonable profit to the manufacturer. It would appear that the buyers of the large-size pipes are more or less at the mercy of the few firms in the country who are able to supply their requirements; so that it is within the power of these firms, or of the Cast-Iron Pipe Association, to quote their own prices, and refuse to supply them for less, though we have had no evidence that excessive prices have been charged. We think that, as a precautionary measure, the municipal authorities should have access to the figures of the costs of production; and we consider that the Board of Trade should be empowered to require firms to submit audited statements showing the costs of production, together with the latest balance-sheets, &c.

Conclusions.

In conclusion we find that:

(*a*) There is an effective combination of manufacturers of pipes and castings—namely, the Cast-Iron Pipe Association—which fixes minimum prices, and which comprises practically all manufacturers of cast-iron pipes.

(*b*) In view of the fact that prices are fixed by an Association, the practice of submitting tenders has become, in fact, of no value as a protection to the ratepayer.

(*c*) The municipal authorities are more or less at the mercy of the Cast-Iron Pipe Association, as they are unable to secure pipes of British manufacture except through members of the Association; and we are of opinion that the Association has it within its power to act unreasonably if so disposed. We suggest, therefore, that, as a safeguard to the ratepayer, the Board of Trade should have power to require the production of audited statements of the costs of production, together with the latest balance-sheets, &c.

(*d*) The profits made by the firms whose accounts have been examined by the Chief Accountant appear to be not unreasonable. We have not, however, investigated the trade in pig iron. We are aware that the operations of the firms reported upon must depend for their financial results largely upon the price at which pig iron reaches them. Any firm which is interested, not merely as a distributor of pipes, &c., but as a producer of, or trader in, pig-iron, may have made profits on a much larger scale than anything reported upon above.

Excess Profit Duty on a Gas Undertaking.—It was intimated at a meeting of the Bangor (co. Down) Urban District Council that payment of excess profit duty was being demanded in respect of the gas undertaking.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *April* 4.

The London market for tar products continues without any particular change. Apart from road tar, little business is being done, and prices remain nominal.

The home market for sulphate of ammonia continues to absorb supplies on the schedule terms.

Tar Products in the Provinces.

April 4.

The average values for gas-works products during the week were: Benzole 90 p.ct. North, 2s. 10d. to 3s.; crude 65 p.ct. at 120° C., 2s. 3d. to 2s. 5d. naked at makers' works; 50-90 p.ct. naked, North, 2s. 11d. to 3s. 1d. Toluol, naked, North, 3s. to 3s. 1½d. nominal. Coal tar crude naphtha in bulk, North, 1s. to 1s. 0½d. Solvent naphtha, naked, North, 2s. 5d. to 2s. 6d. Heavy naphtha, North, 2s. 9d. to 3s. Creosote, in bulk, North, liquid, 8¾d. to 9¼d.; salty, 8¼d. to 8¾d. Heavy oils, in bulk, North, 10½d. to 11½d. Carbolic acid, 60 p.ct., 1s. 8d. to 1s. 10d. Naphthalene, £20 to £30; salts, £7 to £9, bags included. Anthracene, "A" quality, 10d. to 1s. per minimum 40 p.ct.; "B" quality, nominal.

Manchester District Tar Prices.

The average price per ton realized for the sale of tar for the month of January, according to the sliding-scale, was £5 14s. 11·14d.

FROM A MARKET CORRESPONDENT.

Tar Products.

There has been no alteration in the market for tar products, and business remains exceedingly quiet. Pitch has fallen away further, and the value may be anything between £3 10s. and £5 per ton. With the collieries not working, and practically all the coke ovens in the country closed-down, the output of tar products is restricted. At the same time there is no disposition anywhere to make purchases; and the tendency to lower prices generally is apparent. Creosote appears to have fallen to about 8d. per gallon; and there are people who say it is not worth more than 7d. This is just one-half the price current two or three weeks ago, in spite of the fact that there is comparatively little creosote being made. Solvent naphtha is depressed, owing to the strike in the rubber manufacturing trade. Nominally it is worth 2s. 6d., but could probably be purchased at 6d. less. Crude naphthalene is neglected and quiet at £9 per ton, although lower prices have been mentioned. There is absolutely

Impervious Concrete.

THE FIRST TIME.

For the first time in the history of Concrete Construction Collodial Silicate and Calcium Chloride have been successfully used in conjunction with each other for PERMANENTLY PROOFING CONCRETE against the penetration of water, oils, acids, and alkalis, by acting chemically upon the PORTLAND CEMENT, etc.

NOVOID
THE CONCRETE PROOFER
REGISTERED TRADE MARK

Patent No. 141113.

Testimonial.

The Engineer to an important Gas Company writes as follows:—

"I have pleasure in stating that we have found "NOVOID" a very helpful addition to cement, both for concreting and rendering. It assures quick setting of the cement, and is undoubtedly instrumental in forming a homogeneous and liquid-resisting mixture. I shall certainly make use of it to make walls or floors impervious to liquid."

A Very Impartial Opinion.

"From inquiry and observation we are of the opinion that the claims of "NOVOID" for hardening concrete and rendering it water and oil proof can be substantiated."—*The Concrete Utilities Bureau.*

Write for Booklet "The Supreme Test."

We are Exhibiting at **STAND 127.G.** Building Trades Exhibition, Olympia.

Name and address of Nearest Wholesale Distributor from Sole Manufacturers:—

The Torbay and Dart Paint Co., Ltd.,

26-28, BILLITER STREET, LONDON, E.C. 3.

nothing doing in carbolic acid; and it is difficult to say at what price either sort might be bought. The same remarks apply to cresylic acid. Benzole is in moderate demand, and toluol is without change. In intermediate products, trade is slow and there is practically nothing of interest to report, many works being closed down. Aniline oil and salt continue idle owing to lack of export inquiries. Prices are practically as last reported. Salicylic acid is rather better than recently, although prices are nominally 1s. 4d. per lb.

Sulphate of Ammonia.

There is no change in this. The home demand is being supplied fairly satisfactorily, and there appears to be a small portion of the make left over for export; the price to British Colonies during April and May having been reduced slightly just recently.

From America comes the news that little interest is being displayed in this material, and large manufacturers are very firm in their prices. On the other hand, there are re-sellers who are shading prices slightly; but, even with concessions in view, buyers are holding-off for the present. Spot material is freely offered, and concessions are quite liberal.

Gas Supply in Halifax, Nova Scotia.

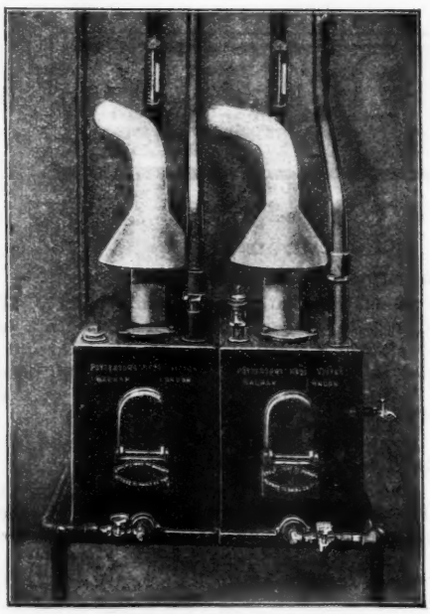
The supply of gas in Halifax, Nova Scotia, has had a chequered history, some particulars of which have been made public by Mr. K. L. Dawson, the Assistant Superintendent of the plant. In the year 1840, certain residents banded themselves together to form a Company to (among other things) "light the town with gas, on account of its security and cheapness;" and during the following year, a contract was let for the construction of a complete works to make 60,000 c.ft. of gas in twenty-four hours, which was thought to be sufficient to supply the demands of 15,000 people. The records show that in 1867 there were 2057 meters, and a consumption of about 22 million c.ft. yearly of "better quality gas than was made at any other point on the continent." Things went smoothly for about another thirty years, when the People's Heat and Light Company erected an opposition plant, and in 1897 bought out the old Halifax Gas Light Company. The new plant was, however, not a success; and after three years the Company were forced to abandon it, and to return to manufacturing gas at the old works. Hard times then fell upon the Company, who were finally forced into liquidation. The assets were purchased in 1902 by the Halifax Electric Tramways Company, Ltd.—now the Nova Scotia Tramways and Power Company, Ltd. The Halifax Tramways Company "kept the gas end of their business well in the background. This is the reason that, as a gas consumer, the city of Halifax is about twenty years behind the times." It is, however, gratifying to learn that, under the administration of the Nova Scotia Tramways Company, an endeavour is being made to place the gas department on an equal footing with others. An entirely new plant has been erected; and the average daily sales have been increased from about 140,000 to 260,000 c.ft.

Ilford Gas Company.

The report which was adopted at the recent meeting of the Company stated that the sale of gas for the year ended Dec. 31 showed an increase of 2·12 p.ct. as compared with 1919. The Company were compelled to increase the price of gas from 4s. 8d. to 5s. 6d. per 1000 c.ft., as from the taking of the indices last Michaelmas. Having been granted a Temporary Increase of Charges Order, the Company are, with the consent of the Board of Trade, enabled to pay dividends at the rates recommended by the Directors—3¾ p.ct. per annum on the "A" and "C" stocks and 2⅝ p.ct. per annum on the "B" stock, both less income-tax. After payment of these dividends, there will be a balance to be carried forward of £2872. The Directors reported the passing of the Ilford Gas Order, 1920, and the obtaining of the Ilford Gas Company (Capital Issues) Consent, 1920, both of which they consider will be of very substantial benefit to the Company. Mr. William Ashmole (the Chairman), who presided, said the Directors, having followed the working of the Company throughout, and knowing the full conditions, considered the results shown in the balance-sheet quite satisfactory. The increased price of gas operating during the last three months of the year did not yield its full amount, because, in the case of slot-meters, the rating had to be altered; and, as the mechanism of certain types of meters was not suitable for the higher price, new attachments had to be bought and fitted to each meter separately. The work entailed meant the alteration of about 8000 meters; and 4500 of these had to be disconnected and brought into the meter repair shop, to have the special attachments fitted. This work was done by the Company's own staff of fitters, and proceeded throughout the quarter. On the meters not changed, the consumers were still being supplied at the old price; and the loss of revenue due to this, together with the cost of the alteration, meant a substantial sum to the Company. The meters were now properly fitted, and any alteration could be made in future at very little expense. It was unanimously agreed that the Directors' fees should be increased from £1500 to £2100 per annum, such increased remuneration to date from Jan. 1, 1920. Mr. Wall, in moving the resolution to this effect, pointed out that since 1911, when the fees were fixed at £1500, the total receipts of the Company had gone up from £73,865 to £186,845. He sent in notice of this resolution nearly two years ago; but the Directors had asked him not to press it at that time, as they felt the gas industry was then under a cloud.

The Spenborough District Council, last week, approved an estimate by the gas engineer of £24,100, in respect of the cost of likely works to be carried out in connection with the Heckmondwike and Gomersal Gas Companies' undertakings, for inclusion in the Special Gas Order being promoted by the Council with a view to the purchase of these undertakings.

"VICTOR" GAS BOILERS.



A first-rate example of Boiler Plant in connection with Hot Water Heating Apparatus, reproduced from actual practice.

The reputation of "VICTOR" Gas Boilers as efficient water heaters stands upon a very firm foundation, and is daily becoming more secure. Their reliability and durability is demonstrated by a long record of successful progress, extending over a period of nearly twenty years.

Substantially constructed throughout of cast-iron, with adequate access for the removal, *in situ*, of lime and flue deposits, "VICTOR" boilers receiving regular attention by way of cleaning can be maintained at a high standard of efficiency.

Hot Water Heating,
Hot Water Supply,
and Allied Subjects

will be specially treated at the forthcoming **Building Trades Exhibition at Olympia, April 12-26,** showing by PRACTICAL demonstration the most efficient method of using gas for all purposes connected with water heating.

THOMAS POTTERTON,

Works: BALHAM, LONDON.
(Telephone: STREATHAM 2052/3.)

STAND 61, ROW D.
(Telephone: HAMMERSMITH 2101.)

A Protest against Price Revision.

The General Purposes Committee of the Bethnal Green Borough Council report that they have received a communication from the Commercial Gas Company giving notice of the Company's application to the Board of Trade for a variation of the Order providing for the modification of the statutory provisions regulating the charges to be made for gas supplied by the Company and the amount to be paid for dividends. The Committee are seriously concerned at the fact that, though the Company, as recently as July 3, 1920, were granted an Order by the Board of Trade authorizing the Company to increase the price of gas from 4s. 2d. to 4s. 8d. per 1000 c.ft., the Company now desire authority further to increase the price to 5s. 6d. per 1000 c.ft. In their opinion, if the application is granted, serious hardship will ensue to inhabitants of the borough, who are, for the greater part, members of the working class, and in the majority of cases take their supplies of gas on the slot-meter system. Though the statistics of the Board of Trade show that the cost of living, so far as food is concerned, is falling, the increased cost to which the public are put in many other directions—such as the consumption of gas—counteracts any material benefit the public might otherwise derive. In the circumstances, the Committee have asked the Board of Trade to give careful consideration to the application, and to take steps to safeguard the interests of working-class boroughs like Bethnal Green.

Lamps on Footways.—The Works Committee of the Deptford Borough Council report that they have received an application from the South Metropolitan Gas Company for permission to erect seven high-pressure gas-lamps on standards to be placed on the footway in front of certain premises in New Cross Road. They say, however, that the trend of recent legislation, and the practice of the Committee, have been to keep the footways clear of all obstructions, in view of the risk to pedestrians from the present-day traffic; and they have accordingly informed the Gas Company that they are unable to consent to the application.

STOCK MARKET REPORT.

THE Stock Exchange re-opened on Tuesday to another four-day week—and perhaps it was quite long enough, too; for there was little in it from which any satisfaction could be extracted. The tightness of the Money Market and the threat of coal-strike paralysis, to say nothing of the many other national and international problems to cause unrest, were quite sufficient to keep markets deadly dull.

In the gilt-edged market, Home Government issues moved irregularly; but the closing figures on Friday were not the worst of the week, the big four marking thus: Consols 48½ 49, War Loan 86⅞-87 3/16, Funding 69⅞ 70⅜, Victory 76⅞-77⅜. Bonds were lower. Corporation issues were steady. Home Rails were run up at first, but tumbled down again when the profit-snatching set in. Canadian were unsteady, and Argentine easier.

The Foreign Market showed some good points: Argentine, Brazilian, Chinese, and Italian were firm; but French and Egyptian eased.

The Miscellaneous Market was not strong. Rubber and Oils fluctuated, but were mostly lower, and Textiles, Shipping, and Iron and Steel were similarly affected.

Business in the Gas Market was on a much reduced scale, opening very quietly and getting more and more so as the week went on. The tone in general was less firm; the bogey of coal shortage agitating some. In the London companies, Gas Light Ordinary was down 1½; but South Metropolitan and Commercial did not move. In the Suburban and Provincial group, Bournemouth and Newcastle were slightly lower. Imperial Continental was steady, and Primitiva preference 1/16 better. Monte Video was put down 5½. Other changes in quotation were *ex div.* adjustments.

Bargains done for cash during the week were as follows: On Tuesday, Alliance and Dublin 40, 40¼. British 23½, Commercial debenture 45, European 7, Gas Light ordinary 54¼, 55½ ditto maximum 41, Imperial Continental 162, 162½, 163½, 164. ditto debenture 77, Monte Video 70¾, Primitiva 10s., South Metropolitan 62⅝. 63½, Croydon 10 p.ct. maximum "E" 95½, Southgate District 5 p.ct. preference 60, 60½. On Wednesday, Bombay 4½, Brentford "B" 52, Commercial 4 p.ct. 52, European 6⅞, Gas Light ordinary 54¼. 54½. 54⅜. 54⅝. 55, ditto debenture 47½. Imperial Continental 162½, 163½, 164, River Plate 39½, South Metropolitan 63½, Croydon 10 p.ct. maximum "E" 96½. On Thursday, Continental Union 20, European 6½, Gas Light ordinary 54¼ 54½. 54⅞, Imperial Continental 162½, 163, 163½. Primitiva 10s., South Metropolitan 63, 63½, Barnet District 4 p.ct. debentures 52, Kingston-on-Thames 44½. On Friday, Croydon "B" and "C" 93½. 93⅝, Gas Light ordinary 53, 54, 54½. 54½, ditto maximum 41, ditto 10 p.ct. bonds 131, 132, Imperial Continental 161, 162, and 175 (exceptional), Monte Video 60, 65. 67, South Metropolitan 63¼. 63½, South Suburban 57½. Tottenham "B" 51, Guildford 44½, Redhill 5 p.ct. "B" 46.

In the Money Market, the demand continued, but fluctuated in degree, intensifying at times and then slightly moderating; but the week closed very firm. Discount rates ruled firm up till the close of the month, when they eased. Silver gave way in the face of considerable sales. The Bank rate remains at 7 p.ct., as fixed on April 17, 1920.

The Warrenpoint (co. Down) Gas-Works are being offered for sale as a going concern.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S BARGAINS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Bargains.
£			p.c.					
182,049	Stk.	Mar. 11	4	4%	Aldershot 4 p.c. Pref. .	...	53—58	...
1,551,868	,,	Oct. 14	2½	3½%	Alliance & Dublin Ord.	59—64	38—43	40—40¼
374,000	,,	Jan. 13	4	4%	Do. 4 p.c. Deb.	76—79	47—52	...
280,000	5	Oct. 28	7½	8%	Bombay, Ltd. . . .	3½—6½	4—4½	4½
100,000	5	Feb. 25	16	5%	Bournemouth Gas and Water { 5 p.c. . .	...	7—8	...
383,110	10	,,	7	7%	B 7 p.c. .	15—15½	8½—9½	...
115,000	10	,,	6	6/-	Pref. 6 p.c.	13½—14	7½—8½	...
162,065	—	Dec. 30	—	4%	4 p.c. Deb.	...	55—60	...
992,045	Stk.	Feb. 25	14	30/-	Brentford A Consolid. .	261—266	50—55	...
734,920	,,	,,	11	26/3	Do. B New . .	204—209	47—52	52
55,000	,,	,,	5	5%	Do. 5 p.c. Pref. .	109—111	68—73	...
221,400	,,	Dec. 15	4	4%	Do. 4 p.c. Deb. .	91—93	57—59	...
214,775	,,	Mar. 11	11	7½%	Brighton & Hove Orig. .	208—213	95—105	...
244,200	,,	,,	8	5½%	Do. A Ord. Stk.	154—159	65—75	...
1,287,500	Stk.	July 29	5	5%	Bristol 5 p.c. max. . .	...	...	...
530,000	20	Mar. 30	12½	10%	British	44—45	21—23*	23½
120,000	Stk.	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	88—90	50—55	...
245,771	,,	,,	4	4%	Buenos Aires 4 p.c. Deb.	85—87	37—40	...
100,000	10	May 27	—	—	Cape Town & Dis., Ltd.	1½—2½	7—7½	...
100,000	10	Dec. 10	—	4½%	Do. 4½ p.c. Pref. .	4—6	5—6	...
100,000	Stk.	Dec. 30	4½	4½%	Do. 4½ p.c. Deb. Stk.	70—75	53—60	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord. . .	108—110	...	...
1,513,280	,,	Feb. 25	5/9/4	30/-	Commercial 4 p.c. Stk.	106—108	50—53	52
560,000	,,	,,	5½	26/3	Do. 3½ p.c. do.	103—105	47—52	...
475,000	,,	Dec. 15	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	42—45	45
800,000	,,	Dec. 11	4	—	Continental Union Ltd.	76—79	20—25	20
200,000	,,	,,	7	—	Do. 7 p.c. Pref.	115—118	30—40	...
51,600	,,	Feb. 5	15	10%	Croydon A 10 p.c. .	...	120—130	...
278,400	,,	,,	12	7½%	Croydon B and C 7 p.c.	...	90—100	93½—93¾
492,270	Stk.	—	6	4½%	Derby Con. Stk. .	123—125	...	.
55,000	,,	—	4	4%	Do. Deb. Stk. .	102—104	...	...
1,002,180	10	Jan. 29	10	5/0	European, Ltd. . .	17½—18	6½—7½	6½—7
16,298,975	Stk.	Feb. 10	4/17/4	30/-	Gas Light and Coke { 4 p.c. Ord. . .	96—102	53—55	53—55½
2,600,000	,,	,,	3½	26/3	3½ p.c. max. .	76—79	40—43	41
4,062,235	,,	,,	4	4%	4 p.c. Con. Pref.	96—99	56—59	...
4,674,850	,,	Dec. 15	3	3%	3 p.c. Con. Deb.	72½—74½	46—49	47½
130,000	,,	Dec. 11	10	10%	10 p.c. Bonds. .	...	...	131—132
82,500	,,	Mar. 11	5	3½%	Hastings & St. L. 5 p.c.	...	53—58	...
258,740	,,	,,	3½	2½%	Do. 3½ p.c.	87—89	27—39	...
70,000	10	May 13	11	8%	Hongkong & China, Ltd.	16½—16¾	8½—9½	...
86,600	Stk.	Mar. 11	9	5½%	Hornsey 7 p.c. . . .	...	75—85	...
131,000	,,	Mar. 30	7½	3½%	Ilford A and C . . .	151—154	75—79*	...
65,780	,,	,,	6½	2½%	Do. B	115—118	55—60*	...
65,500	,,	Dec. 30	4	4%	Do. 4 p.c. Deb. . .	92—94	54—56	...
4,940,000	,,	,,	9	4½%	Imperial Continental .	150—160	161—166	161—164
1,235,000	,,	Feb. 10	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	74—80	77
235,242	,,	Mar. 30	6½	3½%	Lea Bridge Ord. 5 p.c. .	119—121	58—63*	...
2,498,905	,,	Feb. 26	10	37/6	Liverpool 5 p.c. Ord. { A.	211—213	...	...
					{ B.	146—148	...	...
306,083	,,	June 26	4	4%	Do. 4 p.c. Pr. Deb. Stk.	...	...	...
165,736	,,	Feb. 25	7/5/6	3½%	Maidstone 5 p.c. . .	...	52—57	...
75,000	5	June 11	6	5%	Malta & Mediterranean	4½—4¾	1½—2½	...
250,000	100	Apl. 1	4½	4½%	Met. of Melbourne { 4½ p.c. Deb.	99—101	88—93*	...
541,920	Stk.	Nov. 26	4	6%	Monte Video, Ltd. . .	11½—12	60—70	60—70½
1,875,892	,,	Feb. 25	4½	3½%	Newcastle & Gatsh'dCon.	98½—99½	57½—58½	...
529,705	,,	Dec. 30	3½	3½%	Do. 3½ p.c. Deb.	82—83	50—51	...
15,000	10	Mar. 11	—	6%	North Middlesex 10 p.c.	...	12½—13	..
55,940	10	,,	7/14/0	5½%	,, ,, 7 p.c.	14—15	7—7½	...
300,000	Stk.	Nov. 26	8	8%	Oriental, Ltd. . . .	117—122	90—100	...
60,000	5	Mar. 26	10	1/-	Ottoman, Ltd. . . .	7½—7¾	2—3	...
60,000	50	Feb. 25	13	7½%	Portsea Island, B . .	128—131	65—70	...
100,000	50	,,	12	6½%	Do. C . .	118—121	50—55	...
249,980	5	April 29	8	—	Primitiva Ord. . . .	5½—6	½—¾	10/-
499,960	5	June 26	5	—	Do. 5 p.c. Pref. .	4½—5	1/8—1/7	...
521,600	100	Dec. 1	4	4%	Do. 4 p.c. Deb. .	91—93	67—69	...
600,000	Stk.	Jan. 27	4	4%	Do. ,, ,, 1911	...	37—40	...
346,198	,,	Dec. 30	4	4%	River Plate 4 p.c. Deb.	85—87	37—40	39½
150,000	10	Mar. 30	6	6/-	San Paulo { 6 p.c. Pref.	10½—11	6—7*	...
125,000	50	Jan. 3	5	5%	{ 5 p.c. Deb.	47—49	37—39	...
135,000	Stk.	Mar. 30	10	5%	Sheffield A	223—224	63—68*	...
209,984	,,	,,	10	4½%	Do. B	222—224	63—68*	...
523,500	,,	,,	10	3½%	Do. C	220—222	60—62*	...
133,201	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.c. . .	...	...	...
90,000	10	Sept. 30	9	9%	South African . . .	10½—11½	10½—11½	...
6,609,895	Stk.	Feb. 10	5/4/0	5%	South Met. Ord. . . .	111—113	62—65	62½—63½
250,000	,,	Jan. 13	—	5%	Do. Red. Pref. .	...	90—92	...
1,895,445	,,	,,	3	3%	Do. 3 p.c. Deb..	72½—74½	43—48	...
224,820	,,	Feb. 25	8½	7½%	South Shields Con. Stk.	157—159	86—88	...
2,087,795	,,	,,	6	3½%	S'th Suburb'n Ord. 5 p.c.	114—116	56—61	57½
247,358	,,	Dec. 30	5	5%	Do. 5 p.c. Deb. Stk.	116—118	64—70	..
647,740	,,	Nov. 12	7½	3½%	Southampton Ord. . .	99—102	55—58	...
121,275	,,	Dec. 30	4	4%	Do. 4 p.c. Deb. Stk.	...	57—59	...
120,000	,,	Feb. 25	—	3½%	Tottenham { A 5 p.c. .	135—138	57—62	...
782,275	,,	,,	6	2½%	District { B 3½ p.c. .	115—117	50—55	51
181,255	,,	Dec. 15	4	4%	{ 4 p.c. Deb.	87—89	55—58	...
182,580	10	Dec. 30	5	—	Tuscan, Ltd. . . .	5—6	1—2	...
149,900	10	July 1	5	5%	Do. 5 p.c. Deb. Red.	93—95	43—50	...
236,476	Stk.	Feb. 25	5	3½%	Tynemouth 5 p.c. max.	108½—109	68—70	...
					Wandsworth, Wimbledon, and Epsom—			
30,000	,,	Feb. 25	8½	47/6	Wandsworth A 5 p.c.	151—156	75—80	...
253,636	,,	,,	6½	32/6	Do. B 3½ p.c.	129—134	53—58	...
108,075	,,	,,	—	33/3	Do. C . . .	...	50—55	...
140,865	,,	,,	—	33/3	New Ordinary . . .	...	50—55	...
352,000	,,	,,	6½	26/3	Wimbledon 5 p.c. . .	117—122	43—48	...
98,000	,,	,,	6½	32/6	Epsom 5 p.c. . . .	121—126	50—55	...
88,416	,,	Dec. 30	5	5%	5 p.c. Deb. Stk. . .	66—69	40—45	...

* Ex Div.

Paisley Gas-Works Extensions.—The Corporation of the Burgh of Paisley have made application to the Secretary for Scotland for a Provisional Order authorizing the borrowing of £100,000, to meet the cost of certain extensions and improvements at the gas-works.

Carbonizing Plant at Shotley Bridge.—The Shotley Bridge and Consett Gas Company, who are paying a dividend of 5 p.ct. per annum (less income-tax), decided, owing to the great increase in the cost of the manufacture of gas, to reconstruct and modernize their carbonizing plant, with the object of introducing a more economical method of working. The work is now making good progress; and the Board have every confidence that the alterations, when completed, will result in great benefit to the Company. Some additional capital will be required for the purpose of the scheme; and application is to be made to the Board of Trade for a Special Order giving powers in this connection.

Glasgow Gas Charges.—At the Glasgow Town Council meeting last week, Bailie Renfrew submitted the minutes of the Gas Committee containing a proposal that the price of gas be increased from 4s. to 4s. 7d. per 1000 c.ft. He said they were compelled to advance the price owing to the fall in the market price of the bye-products, consequent on the Americans and Germans flooding the markets with these bye-products. The Manager of the Gas Department had put before the Committee a statement showing that, at present prices if the existing charges for gas were continued, there would be a deficiency of £100,000 to £150,000. The only hope of a reduction in the price of gas lay in the possibility of a reduction in the price of coal. The minute was approved of.

Alleged Noxious Fumes at Longton.—Mr. E. Patterson submitted, at the last meeting of the Stoke-on-Trent Town Council, a petition signed by 400 residents of Longton, protesting against the nuisance caused by the noxious fumes which proceeded from the sulphate plant at the Longton Gas-Works. He stated that around the works where the nuisance existed, there was a large population of working people; and the fumes were acid and corrosive. He knew of cases in which doctors had advised people immediately to leave the neighbourhood, on account of the injurious effect of the fumes upon their health. There had certainly been an improvement recently; but the residents wanted to be assured that a remedy would be found. Alderman Brookhouse (Chairman of the Stoke Gas Committee) said the nuisance had been remedied; but there was always the possibility that it might recur. The Committee, he said, were doing all in their power to remove the nuisance.

In connection with the Commercial Mutual Club, a successful dinner was held at the Florence Restaurant, Rupert Street, W., on Wednesday last, Mr. L. F. Tooth, the President of the Club, being in the chair. After the toast of "The King," the Chairman, in proposing "The Club," stated that, though the Club had been in existence for twelve years, this was their first dinner. He sincerely hoped it would be in future an annual function. The Club, due to the good work of its officers, was in a sound financial position; contributions having increased, in spite of a small decrease in membership. He wished to see the mutual good feeling which existed in the Club extended throughout the whole of the Company's works and offices; for it was this spirit which operated for the welfare of the Company, and helped to pull one through life. The Commercial Gas Company's Sports Club needed thoroughly sound support and good feeling to encourage those who were trying to do so much for the recreation of the employees. The toast of "The Chairman" was proposed by the Vice-President (Mr. S. J. Musto) and received with musical honours.

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